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OIL & GAS JOURNAL

DATA BOOK

1989 EDITION

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FOREWORD

The new edition of the *OGJ Databook* chronicles a near repeat of the "Crash of '86," when the Organization of Petroleum Exporting Countries (OPEC) went for market share and its members and competitors almost went broke.

After a prosperous 1987, a new market share battle within OPEC destroyed a promising year for upstream operations while fattening margins downstream. Thus, as 1987 turned out better than forecasters expected, 1988 turned out to be far worse. That is, prices and investment in exploration, drilling, and producing operations were well below expectations last year, while refiners and petrochemical companies could hardly believe the good news. The year gave planners yet another humbling experience while posing a fresh challenge for 1989.

Which will it be? A rerun of 1987, when the market and industry started out doubting OPEC could realize its official $18/barrel price, but ended the year as believers, or yet another year of prices depressed by the weight of overproduction?

Once more, those who are obliged to make this judgment must answer a now familiar question first: How will OPEC choose to manage the surplus? That will be the threshold question again this year and for future years well into the next decade.

You can make a case for two opposing judgments.

First, you can argue that OPEC as a group has learned its lesson: No more market share battles, either within the organization or with other exporters; they are very expensive exercises in futility. If that lesson wasn't driven home by the bloodbath of '86, when Saudi Arabia miscalculated that high-cost non-OPEC production would be shut-in at $20, then it should have been by the near repeat in 1988. The Iran-Iraq War is over, the Iraqis are back under the OPEC tent, and several non-OPEC exporters were talking about production cuts as the new year began. Sticking to the slightly higher production quotas would mean higher prices and revenues, a result favorable to all. The logic is so compelling that it can hardly fail.

But the contrary view is just as persuasive. Exporters have always needed more money, regardless of how much they had at the moment. That's the very reason they cheated on quotas. The first cheater habored an illusion: He could boost his volume without breaking the price. Indeed, he could have done so had others not followed suit. But others inevitably followed, and promptly. Saudi Arabia — the OPEC Enforcer — wasn't far behind, deliberately breaking the price demonstrating a new that cheating didn't pay, and protecting its market share in the bargain. That scenario led to the new agreement last November, which appeared more stable than the one ending the previous price war two years ago.

But appearances may deceive. It will be no surprise if this agreement starts to unravel during the first half of '89. If it does, Abu Dhabi — the most flagrant quota violator of '88 — is the leading candidate to defect, thereby bringing down the market and the world petroleum industry in the process, testing whether more powerful gulf neighbors have reached the limits of their patience with the tiny emirate.

As 1989 began, major companies were budgeting for $15/barrel crude oil, the market price in December. Majors' producing divisions, together with independents and service companies, hoped the price would strengthen by fourth quarter 1989 to approach $18. Forecasters were projecting an average of $16-17/barrel for West Texas Intermediate crude for the year. If the consensus turns out to be right, it will mark a first for the '80s, a decade during which oil companies continued to forecast, but for the most part stopped publishing their predictions.

As this edition shows, industry and consumers, when given the opportunity, respond quickly to price. Where markets were open, lower oil prices spelled higher demand in 1988 in the U.S. and around the world. On the strength of gains of 3.8% in the Pacific region and 2.1% in North America, non-Communist demand rose 1.8%, or 900,000 barrels per day, to an estimated 49.[illegible] million barrels per day. Demand rose faster in developing countries (2.3%) than industrial countries (1.7%), and didn't gain at all in Europe, where oil is still officially discouraged by taxes or policy biases in favor of other fuels.

World production rose even faster than demand, with OPEC capturing almost all of the 1.7-million-barrel-daily gain and sending prices tumbling. United States production, with old fields declining faster than new ones could be brought on stream at current prices, ran counter to the trend.

For 1989, the outlook is somewhat different. Slightly higher prices and slower economic growth should spell further gains in consumption, but at a slower rate about 1% for all non-Communist countries, slightly higher in the United States. With stocks bloated from overproduction last year, markets will be satisfied with a modest growth in production. The U.S. is in for another decline, while imports will rise once more.

Drilling still hasn't shaken off the "Crash of '86." After building up a head of steam in the second half of 1987, drilling had another disappointing year. The rig count sagged along with prices in the U.S., ending up just below last year's modern-day low of 936. This year should be marginally better: about 950 active rigs at $15/barrel, somewhat higher if oil and gas markets improve.

Canada, hard to predict with its yo-yo incentive system, should hold about steady at 200 rigs, unless the government pulls the rug out from under operators again.

Drilling outside North America, less subject to rapid budget changes, turned in a 6% gain to 1,030 active rigs, and should improve to 1,050 in 1989. The greater relative strength in international drilling reflects two important factors: the longer-term nature of drilling commitments outside the U.S. and Canada, and the continuing flight of capital from the U.S. The 20 largest producing companies now spend half their exploration/drilling budgets in other countries, a much larger percentage than before. As prices fall and other governments improve their terms to compensate, the U.S. has a more difficult time competing for international drilling capital.

As a result of these factors, plus more favorable geology in other countries, oil and gas reserves continue to decline in the U.S. and rise elsewhere. The oil glut is still the biggest single factor in the market, while gas markets are improving. The first significant long-term gas contract in years was signed by an interstate pipeline as 1988 drew to a close. A large Gulf Coast supply was linked to a new market — power generation in Florida — signaling better conditions ahead for gas producers as the bubble shrinks further.

The "OGJ 400" illustrates once more the widely varying fortunes of individual companies. Strategy and strategic positioning count for a lot. Whereas industry trends overwhelm some companies, others are able to swim against the tide. Still others position themselves so that when one division runs into wall, another may be charging ahead in a different, prosperous direction.

The petroleum industry, in the aggregate, tends to rise and fall with the price of crude oil and natural gas. Thus, the 1987 performance of the "OGJ 400," as set forth in this edition, was much improved over the year before. Higher crude prices squeezed refining margins late in the year, but total revenues and net income reversed a 5-year decline in this, the sixth year of the report. Returns on assets, revenues, and equity all improved over the previous year. Almost half the "400" showed a profit, a marked improvement over the 116 that stayed in the black the year before.

A study of the "400" demonstrates the importance of interpreting statistics. The top 20 companies had net income exceeding $14 billion. That was $5 billion more than the "400" as a group. The explanation: the remaining 380 companies had a net loss, most of it — $4.4 billion — by a single company, which had huge write offs of expenses of fighting a hostile takeover and the biggest single court judgment in business history. In these circumstances of volatile markets and wholesale restructuring, group returns mean less than nothing. It is in individual results that significance is found.

The next "OGJ 400" will show how profits shift from upstream to downstream when raw material prices fall and products prices don't follow immediately. This happened, as the current *DataBook* recounts, because downward pressure came from oversupply of raw materials, not the finished products.

In most years, given adequate capacity in all divisions, prices of refined products will rise and fall with the price of crude oil. Not so in 1988. Supply and demand for motor gasoline, for example, were in close balance in the U.S. (though not in other countries, where margins were much slimmer). Refinery utilization was the highest since 1978, the year demand peaked. But the supply-demand balance was even tighter than the 84% basic operating rate would suggest. Gasoline-making capacity, crimped by rising octane demands, the lead phaseout, and loss of some units to explosions and fires, had to be run flat out to satisfy growing requirements for higher-octane, unleaded motor fuel.

Thus, there was no magic in the act of levitation that gasoline prices seemed to be performing. it had a sound basis in economics. Instead of being pushed down by falling crude prices, gasoline prices were propped up by the disappearance of surplus capacity downstream. And this, in turn, helped to break the fall in crude prices, which might otherwise have plunged to 1986 lows before OPEC could turn down the taps.

This is the grand sweep of the statistical story as it unfolds in the 1989 *DataBook*. If the past is indeed prologue, these and deeper insights will be the reward of the diligent student who sees in figures not the end of analysis, but the beginning.

Gene T. Kinney, Editor
Oil & Gas Journal

RANGER
WISER
CONQUEST EXPLORATION COMPANY
Mc
McFarland Energy, Inc.
Tipperary CORPORATION
TAURUS PETROLEUM INC
SUN
Ethyl
SONAT
ZAPATA
DOUBLE E
Tidewater
QED EXPLORATION, INC.
Norcen

More companies in OGJ400 made more money in fiscal 1987

Glenda Smith
Statistics Editor

More U.S. public oil and gas companies made a profit in fiscal 1987 than in 1986. And most financial performance indicators of the OGJ400 group of companies improved during 1987 compared to the previous year, or slipped only slightly.

As in 1986, companies with refining or petrochemical operations fared better than firms that had to depend solely on revenues from oil and gas production.

Higher crude prices late in the year began to squeeze high refining and petrochemical profit margins of the previous year, but higher feedstock prices didn't last into 1988. This year, low crude prices and strong product demand will again combine to give refiners and petrochemical manufacturers healthy profit margins (OGJ, Aug. 15, p. 15). During 1987, many companies without downstream operations also began to regain health. Drastic cost cutting and reorganization began to pay off, and crude and natural gas prices recovered from modern day lows reached in 1986.

As 1988 began, confidence in the industry's ability to find and produce oil and gas at a profit in the U.S. was returning, and the year promised to be the first in a steady—but modest—recovery.

That upstream recovery has been delayed.

With more than half the year gone, crude prices still have not returned to late 1987 levels. The Middle East's huge excess producing capacity and overproduction by OPEC members still undermine world oil markets.

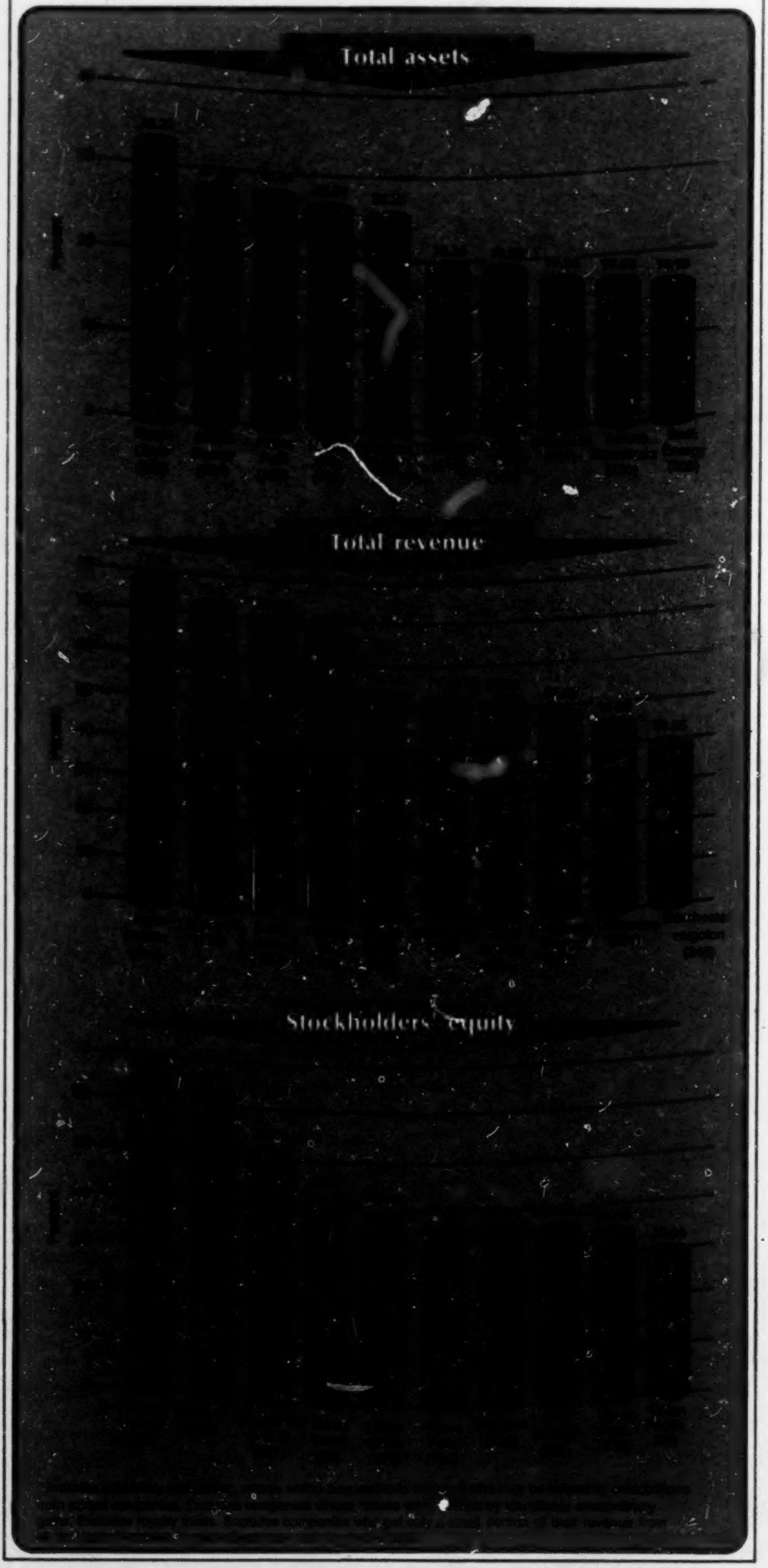
And in the U.S., natural gas supply is still more than adequate, keeping prices down.

But most companies that survived the crash of '86 are vastly better able to operate at a profit under these conditions.

And most believe the steady, modest recovery expected in upstream revenues and profits in 1988 has only been postponed, not canceled.

As a group, the 1987 performance of the OGJ400 is much improved over the year before.

Top companies in return on...*



The top 20 in total revenue

Rank	Company name	Total revenue, $ million
1	Exxon Corp.	83,335.0
2	Mobil Corp.	56,716.0
3	Texaco Inc.	35,315.0
4	Chevron Corp.	29,097.0
5	Amoco Corp.	22,388.0
6	Shell Oil Co.	21,222.0
7	Occidental Petroleum Corp.	17,746.0
8	ARCO	17,608.0
9	BP America	15,562.0
10	Tenneco Inc.	14,957.0
11	Conoco Inc.	11,097.0
12	Phillips Petroleum Co.	10,917.0
13	USX (Oil & Gas Segment)	10,074.0
14	Sun Co.	9,817.0
15	Unocal Corp.	9,393.0
16	Coastal Corp.	7,536.0
17	Ashland Oil Inc.	7,311.3
18	Enron Corp.	5,915.8
19	Amerada Hess Corp.	4,784.6
20	Transco Energy Co.	3,250.2
	Total	**394,041.9**

Based on fiscal year periods, two key indicators—total revenue and net income—reversed 5-year declines in this, the sixth year of the report. And the group's return on assets, on revenue, and on equity all improved during 1987, although all remained at very depressed levels.

Almost half the 400 firms showed a profit for fiscal 1987, a welcome increase over the 116 companies that showed a profit during fiscal 1986.

For about two-thirds of the companies in the OGJ400, the fiscal year coincides with the calendar year. But different reporting periods make it necessary to use care in comparing one company's results with another's on a year-to-year basis.

Most operating categories showed gains, too, with two important exceptions. U.S. and world reserves of natural gas held by the group dropped significantly because Exxon removed almost 7.8 trillion cu ft of Prudhoe Bay, Alaska, natural gas from the proved, undeveloped category.

"Although geologically identified, these reserves are excess to local consumption and require a transportation system to additional markets," said Exxon in its annual report.

"This change reflects no lessening of efforts to achieve timely development of this important resource, which the company is confident will occur in the future."

ARCO had revised its natural gas reserves downward by about 8.3 trillion cu ft in 1985 "as a result of economic factors." Most of the revision was related to Alaska North Slope reserves. And BP America deleted 5.66 trillion cu ft of Alaskan reserves in 1986. Before dropping these reserves, Exxon led the group in U.S. and in worldwide gas reserves. In 1987, after removing Prudhoe Bay, the company dropped to second place in U.S. gas reserves, but held onto first place worldwide.

There also was a significant drop last year—13%—in net wells drilled in the U.S. by the group. The decline reflects continued pressure of low oil and gas prices on drilling activity.

The OGJ400 roster is constantly changing, and since the same companies are not included each year, comparisons cannot be made on an identical basis. But industry trends over the past 6 years are apparent in the performance of the group.

Here are highlights of how this year's group of companies performed:

- Total assets of the group gained marginally over fiscal 1986 to $501 billion.
- Total revenue increased a respectable 5.6% compared with last year's group, reaching $446 billion.
- And net income for this year's OGJ400 companies was a bright spot, jumping 80% to almost $9.4 billion. This gain reverses a 68.5% drop by the 1986 group, compared with 1985 results, and would have been much greater but for a huge writeoff and loss by one company, Texaco.
- Capital and exploratory spending declined in 1987 by more than 5% as a result of continued consolidation and uncertainty about prices.
- The group's liquids reserves—both in the U.S. and worldwide—increased in 1987 compared with 1986, but Exxon's removal of Alaskan gas reserves caused reported natural gas liquids reserves to drop. Reported U.S. liquids reserves gained more than 3%; worldwide liquids reserves gained more than 2%.
- Liquids production by this year's group declined modestly, both in the U.S. and elsewhere.

Changes. There are 76 new companies in this year's OGJ400, 39 of which are limited partnerships. Included in the list are 63 limited partnerships and seven royalty trusts.

Of the limited partnerships, 10 are at least 50% owned by another company on the list, so some double counting does occur.

Also in this year's group are 40

Some key changes from 1987 OGJ400*

How company appeared on last year's list	Why change?	How company appears on this year's list—
American Quasar	Name changed to	Wolverine Exploration
American Royalty Trust	Merged into	Freeport-McMoRan Energy Partners
Argo Petroleum	Sold oil & gas assets to	National Fuel Gas
Bayou Resources	Merged into	Patrick Petroleum
Black Gold Energy Resources	Merged into	Snyder Oil Partners
Burkhart Petroleum	Name changed to	ZG Energy
Celeron	Merged into	Exxon
Cenergy	Merged into	Conquest Exploration
Diablo Oil	Merged into	Wichita River Oil
Diamond Shamrock	Name changed to	Maxus Energy
Entex Energy Development	Name changed to	General Energy Development
Fountain Oil & Gas	Merged into	Wichita River Oil
FPCO Oil & Gas	Merged into	Freeport-McMoRan Energy Partners
Galaxy Oil	Sold oil & gas assets to	Global Natural Resources
Gerber Energy International	Name changed to	Gold King Consolidated
Greenwood Energy	Name changed to	Greenwood Holdings
Henry Energy	Name changed to	Kimco Energy
Intercontinental Energy	Merged into	Greenwood Holdings
Kaiser Energy	Merged into	Presidio Oil
Kee Exploration	Merged into	Wichita River Oil
Leader Development Corp.	Name changed to	Clinton Gas Systems
May Energy Partners	Merged into	Quinoco Cos.
Noarko Resources	Merged into	Wichita River Oil
Pacific Lighting Oil & Gas	Name changed to	Pacific Enterprises Oil & Gas
Pangea Petroleum	Name changed to	HarCor Energy
Reef Energy	Name changed to	General Energy Resources & Technology
Seaxe Energy	Merged into	Hadson
Sierra Exploration	Merged into	Wichita River Oil
Standard Oil	Name changed to	BP America
Texas Eastern	Sold all oil & gas reserves	to Noble Affiliates
Universal Resources	Merged into	Questar
Wichita Industries	Name changed to	Wichita River Oil
Wicklund Petroleum	Name changed to	Wicklund Holding
ZIM Energy	Name changed to	Mustang Resources

The following companies sold all of their U.S. oil and gas assets during 1987 to private companies, companies not included in the OGJ400 or companies which could not be identified:

American Oil & Gas
Asamera
Crown Central Petroleum
Crown Resource
Dietrich Resources
May Petroleum
Midland SouthWest
ORS Corp.
Petrotech
Royal Resources
Tribune/Swab-Fox
Valero Energy
Yankee Cos.

* In addition to the above changes, 9 companies no longer rank among the top 400, 1 company was taken private, 3 companies are currently in Chapter 11 with no 10K available, 1 company is being liquidated, and others have no 1987 data available yet, asked to be excluded or can not be located.

Fastest growing companies*

Rank by total assets	Company	Stockholders' equity 1987 ($1,000)	Stockholders' equity 1986 ($1,000)	Stockholders' equity % change	Net income 1987 ($1,000)	Net income 1986 ($1,000)	Net income % change	Long-term debt 1987 ($1,000)	Long-term debt 1986 ($1,000)
264	Castle Energy Corp.	3,890	803	384.4	2,502	311	704.5	2,802	2,271
113	Harken Oil & Gas Inc.	68,345	30,979	120.6	3,209	196	1,537.2	26,277	27,474
97	Hadson Corp.	85,057	40,717	108.9	5,851	4,908	19.2	47,756	63,055
25	Freeport-McMoRan Inc.	1,022,235	610,744	67.4	248,751	25,695	868.1	879,758	808,192
209	Swift Energy Co.	10,871	6,617	64.3	4,024	1,108	263.2	0	0
298	Magic Circle Energy Corp.	4,688	2,858	64.0	1,830	546	235.2	0	0
185	Plains Petroleum Co.	24,458	15,692	55.9	9,130	3,588	154.5	1,500	6,500
139	Berry Petroleum Co.	55,474	41,689	33.1	19,355	12,695	52.5	2,676	5,075
386	Texas Vanguard Oil Co.	675	534	26.4	131	110	19.1	0	0
98	Allegheny & Western Energy Corp.	84,150	67,934	23.9	17,413	16,740	4.0	61,062	49,054
29	Arkla Inc.	750,811	616,368	21.8	78,283	64,179	22.0	767,278	677,709
10	Occidental Petroleum Corp.	5,164,000	4,308,000	19.9	240,000	181,000	32.6	6,339,000	7,445,000
55	Hamilton Oil Corp.	349,458	294,729	18.6	21,905	11,007	99.0	288,631	302,851
47	National Fuel Gas Co.	393,490	337,209	16.7	42,492	41,728	1.8	266,309	273,874
254	Falcon Oil & Gas Co. Inc.	5,364	4,648	15.4	441	287	53.7	2,984	669
352	Pioneer Oil & Gas Corp.	1,459	1,270	14.9	160	118	35.6	0	0
8	ARCO (Atlantic Richfield Co.)	5,878,000	5,259,000	11.8	1,244,000	615,000	102.3	286,000	307,000
156	Bogert Oil Co.	19,390	17,432	11.2	1,754	1,647	6.5	16,175	7,020
140	Exploration Co. of Louisiana Inc.	59,001	53,209	10.9	7,570	1,046	623.7	4,500	16,472
17	Coastal Corp.	859,800	788,900	9.0	113,100	71,600	58.0	3,508,800	3,784,100

* Companies were selected on the basis of growth in stockholders' equity. Only companies with positive net income for both 1986 and 1987 were considered. Companies were not considered if they had a decline in net income for 1987, were subsidiaries of another company, or became public within the last year.

The top 20 in net income and in stockholders' equity

Rank	Company	Net income, $ million
1	Exxon Corp.	4,840.0
2	Amoco Corp.	1,360.0
3	Mobil Corp.	1,258.0
4	ARCO	1,244.0
5	Shell Oil Co.	1,230.0
6	Chevron Corp.	1,007.0
7	BP America	564.0
8	USX (Oil & Gas Segment)	447.0
9	Sun Co.	348.0
10	Conoco Inc.	277.0
11	Freeport-McMoRan Inc.	248.8
12	Occidental Petroleum Corp.	240.0
13	Amerada Hess Corp.	229.9
14	Union Exploration Partners Ltd.	207.0
15	Union Pacific Resources Co.	206.0
16	Consolidated Natural Gas Co.	186.0
17	Unocal Corp.	181.0
19	Ashland Oil Inc.	133.4
19	Coastal Corp.	113.1
20	Columbia Gas System Inc.	111.3
	Total	**14,431.5**

Rank	Company	Stockholders' equity, $ million
1	Exxon Corp.	33,626.0
2	Mobil Corp.	16,783.0
3	Chevron Corp.	15,780.0
4	Shell Oil Co.	14,842.0
5	Amoco Corp.	12,107.0
6	Texaco Inc.	9,171.0
7	ARCO	5,878.0
8	BP America	5,574.0
9	Sun Co.	5,229.0
10	Occidental Petroleum Corp.	5,164.0
11	Tenneco Inc.	3,773.0
12	Amerada Hess Corp.	2,158.5
13	Unocal Corp.	1,766.0
14	Phillips Petroleum Co.	1,617.0
15	Enron Corp.	1,613.5
16	Consolidated Natural Gas Co.	1,598.2
17	Columbia Gas System Inc.	1,573.7
18	Meridian Oil Inc.	1,431.5
19	Kerr-McGee Corp.	1,363.0
20	Masa L.P.	1,295.0
	Total	**142,343.4**

companies which are subsidiaries of non-U.S. companies or companies operating in another industry.

This year's list includes a new category of company not previously included. For tax reasons, in recent years, many companies which sponsored drilling and income funds have converted those funds to limited partnerships.

And new LPs have been formed which are similar in function to income funds but have the organization of a limited partnership. Many of the new limited partnerships on the list this year are of this type.

The partnership units of these LPs are publicly held, but they are not publicly traded because no market has been created. While their organizational function differs from an operating independent oil and gas company, an increasingly large percentage of U.S. reserves is being held by companies of this type.

That's why they are included in the OGJ400 group.

Mergers, consolidations, and shifts in ownership of reserves continue. The accompanying table highlights key changes from the 1987 OGJ400 list. Some involve only a name change, others sizable transfers of assets.

And that action is likely not over.

Industry analysts think there is more consolidation among medium-size and smaller companies in the months ahead (OGJ, Aug. 1, p. 12). And in recent months, large companies have indicated they will sell big chunks of their operations.

Expectations that prices will stabilize and begin a recovery in the months ahead continue to fuel restructuring and consolidation activity.

Other changes in the 1988 OGJ400 roster indicated modest improvement in financial health. For instance, to be included in this year's roster of 400 required $646,000 in assets, a dramatic gain from the cutoff last year of $149,000. As as result, several companies from last year's list are not included this year.

Asset value to make the top 100 companies continues to fall, however. In 1984, company 100 had assets of $391 million. In fiscal 1986, that cutoff fell to $237 million, and in this year's list fell again to $203 million.

Of the 400 firms in the group this year, 21 had net profits of $100 million or more; seven companies reported a net loss of $100 million or more. Texaco had the largest net loss: $4.4 billion.

Overall performance. The 1988 group's total revenue of about $445 billion accounted for 9.9% of U.S. gross national product during 1987, up from an 8.8% share.

The 400 firms in the group account for impressive shares of oil and gas production and, reserves, too: 70% of

The top 20 in spending and U.S. net wells drilled

Rank	Company	Capital exploratory spending, $ million
1	Exxon Corp.	7,136.0
2	Amoco Corp.	2,979.0
3	Mobil Corp.	2,942.0
4	Chevron Corp.	2,841.0
5	Shell Oil Co.	2,614.0
6	Texaco Inc.	1,990.0
7	BP America	1,549.0
8	Conoco Inc.	1,480.0
9	ARCO	1,463.0
10	Tenneco Inc.	1,291.0
11	Sun Co.	1,176.0
12	USX (Oil & Gas Segment)	964.0
13	Unocal Corp.	877.0
14	Freeport-McMoRan Inc.	808.9
15	Occidental Petroleum Corp.	757.0
16	Phillips Petroleum Co.	750.0
17	Amerada Hess Corp.	454.6
18	Ashland Oil Inc.	388.9
19	Consolidated Natural Gas Co.	359.7
20	Columbia Gas System Inc.	298.8
	Total	**33,119.9**

Rank	Company	U.S. net wells drilled
1	Shell Oil Co.	1,266.0
2	Texaco Inc.	699.0
3	Mobil Corp.	646.0
4	Amoco Corp.	629.0
5	Sun Co.	453.0
6	USX (Oil & Gas Segment)	428.0
7	Exxon Corp.	374.0
8	Consolidated Natural Gas Co.	289.9
9	Chevron Corp.	283.0
10	ARCO	272.0
11	Unocal Corp.	266.0
12	Pacific Enterprises Oil & Gas Co.	206.1
13	Occidental Petroleum Corp.	189.9
14	Phillips Petroleum Co.	159.0
15	Santa Fe Energy Co.	151.0
16	Conoco Inc.	127.7
17	BP America	122.0
18	Equitable Resources Inc.	109.0
19	Enserch Exploration Partners Ltd.	108.3
20	Enserch Corp.	94.9
	Total	**6,873.8**

The top 20 in liquids reserves

Rank	Company	U.S. liquids reserves, million bbl
1	BP America	309.0
2	Exxon Corp.	276.0
3	ARCO	243.0
4	Shell Oil Co.	204.0
5	Texaco Inc.	197.0
6	Chevron Corp.	185.0
7	Amoco Corp.	142.0
8	Mobil Corp.	112.0
9	Unocal Corp.	63.0
10	Sun Co.	59.0
11	USX (Oil & Gas Segment)	58.0
12	Phillips Petroleum Co.	51.0
13	Tenneco Inc.	39.0
14	Conoco Inc.	39.0
15	Occidental Petroleum Corp.	26.0
16	Amerada Hess Corp.	25.0
17	Union Pacific Resources Co.	21.2
18	Union Exploration Partners Ltd.	20.0
19	Santa Fe Energy Co.	19.1
20	Mitchell Energy & Development Corp.	14.1
	Total	**2,102.4**

Rank	Company	World liquid reserves, million bbl
1	Exxon Corp.	6,634.0
2	Chevron Corp.	3,348.0
3	Texaco Inc.	3,089.0
4	ARCO	3,041.0
5	BP America	3,026.0
6	Shell Oil Co.	2,915.0
7	Amoco Corp.	2,580.0
8	Mobil Corp.	2,397.0
9	Conoco Inc.	1,031.0
10	Phillips Petroleum Co.	909.0
11	Unocal Corp.	897.0
12	USX (Oil & Gas Segment)	798.0
13	Sun Co.	763.0
14	Occidental Petroleum Corp.	736.0
15	Amerada Hess Corp.	471.0
16	Tenneco Inc.	407.0
17	Union Exploration Partners Ltd.	227.0
18	Union Pacific Resources Co.	144.6
19	Santa Fe Energy Co.	139.3
20	Pennzoil Co.	137.0
	Total	**33,680.9**

U.S. liquids reserves and 62% of U.S. natural gas reserves; 64% of U.S. liquids production and 60% of U.S. natural gas production.

Worldwide, the group accounts for 4.1% of liquids reserves and 4.4% of natural gas reserves.

And the top 20 companies in the OGJ400 have big shares of U.S. reserves and production: 64% of U.S. liquids reserves and 46% of U.S. natural gas reserves; 58% of liquids production and 42% of gas production in the U.S. For this year's 400 companies, stockholder equity showed almost no change from a year earlier. But the group's return on equity improved markedly in fiscal 1987, reaching 5.42% compared with 2.99% in fiscal 1986. Return on assets—at 1.87%, and return on revenue at 2.10%, were also higher.

But even with these gains, all three return ratios are at very low levels.

Capital and exploratory spending by the group slipped again in fiscal 1987, but the 5.46% decline was modest compared to a drop in spending in fiscal 1986 of almost one-third, compared to the previous year. The group spent almost $41 billion during last fiscal year.

The ratio of capital expenditures to net income for the group was about 4.4 to 1 in fiscal 1987, compared with 8.5 to 1 in 1986. But the dramatic decline is mainly the result of much higher income in 1987, rather than much lower spending.

Top 20. Though there were exceptions, performance of the top 20 companies in both financial and operating categories was similar to the performance of the group as a whole.

And this year's top 20 companies account for the lion's share of assets, revenues, income, reserves, and production. About 80% of the assets of the entire group belongs to the top 20 companies, 88% of the total revenue accrues to these top 20 firms.

The top 20 in the group own 92% of the U.S. liquids reserves of the 400-company group and 93% of the group's worldwide liquids reserves. Shares of the entire group's gas reserves held by the top 20 firms are 74% in the U.S. and 78% worldwide.

The top 20 companies in net income in this year's OGJ400 had net income of $14.4 billion, up more than 12% from the total for last year's top 20. The same companies, however, are not included in the list both years.

When the other 380 companies in this year's group are included, net income for the 400 firms drops to $9.4 billion this year. But Texaco's loss of more than $4.4 billion accounts for the bulk of the difference between the top 20 firms and the group as a whole.

Fast growers. Selection for the list of the fastest growing companies is based on growth in stockholder's equity. Companies must have had posi-

The top 20 in gas reserves

Rank	Company	U.S. gas reserves, bcf
1	Amoco Corp.	10,690.0
2	Exxon Corp.	9,761.0
3	Mobil Corp.	7,741.0
4	Chevron Corp.	7,078.0
5	Shell Oil Co.	6,541.0
6	ARCO	5,854.0
7	Texaco Inc.	4,783.0
8	Unocal Corp.	4,399.0
9	Phillips Petroleum Co.	3,369.0
10	USX (Oil & Gas Segment)	3,277.6
11	Tenneco Inc.	2,943.0
12	Meridian Oil Inc.	2,807.0
13	Occidental Petroleum Corp.	2,734.0
14	Union Exploration Partners Ltd.	2,524.0
15	Sun Co.	2,232.0
16	Conoco Inc.	1,959.0
17	BP America	1,932.0
18	Mesa L.P.	1,920.6
19	Anadarko Petroleum Corp.	1,717.1
20	Enron Corp.	1,359.9
	Total	**85,822.1**

Rank	Company	Worldwide gas reserves, bcf
1	Exxon Corp.	22,365.0
2	Mobil Corp.	20,287.0
3	Amoco Corp.	15,400.0
4	Chevron Corp.	9,444.0
5	Texaco Inc.	7,847.0
6	Shell Oil Co.	6,914.0
7	ARCO	6,751.0
8	Unocal Corp.	6,093.0
9	Phillips Petroleum Co.	5,285.0
10	USX (Oil & Gas Segment)	4,746.4
11	BP America	3,890.0
12	Conoco Inc.	3,200.0
13	Tenneco Inc.	2,948.0
14	Occidental Petroleum Corp.	2,932.0
15	Meridian Oil Inc.	2,807.0
16	Sun Co.	2,696.0
17	Union Exploration Partners Ltd.	2,524.0
18	Amerada Hess Corp.	2,018.0
19	Mesa L.P.	1,920.6
20	Anadarko Petroleum Corp.	1,772.0
	Total	**131,[illegible]**

The top 20 in liquids production

Rank	Company	U.S. liquids production, million bbl
1	BP America	2,953.0
2	ARCO	2,818.0
3	Shell Oil Co.	2,782.0
4	Exxon Corp.	2,634.0
5	Chevron Corp.	1,809.0
6	Amoco Corp.	1,670.0
7	Texaco Inc.	1,603.0
8	Mobil Corp.	1,024.0
9	Unocal Corp.	656.0
10	Sun Co.	621.0
11	USX (Oil & Gas Segment)	620.8
12	Phillips Petroleum Co.	457.0
13	Conoco Inc.	351.0
14	Tenneco Inc.	270.0
15	Union Exploration Partners Ltd.	227.0
16	Occidental Petroleum Corp.	222.0
17	Amerada Hess Corp.	201.0
18	Santa Fe Energy Co.	139.3
19	Pennzoil Co.	135.0
20	Union Pacific Resources Co.	130.0
	Total	**21,323.1**

Rank	Company	Worldwide liquids production, million bbl
1	Exxon Corp.	637.0
2	Texaco Inc.	355.0
3	Chevron Corp.	329.0
4	BP America	310.0
5	Amoco Corp.	291.0
6	ARCO	266.0
7	Mobil Corp.	227.0
8	Shell Oil Co.	214.0
9	Conoco Inc.	132.0
10	Occidental Petroleum Corp.	110.0
11	Unocal Corp.	97.0
12	Phillips Petroleum Co.	91.0
13	USX (Oil & Gas Segment)	79.7
14	Sun Co.	77.0
15	Tenneco Inc.	55.0
16	Amerada Hess Corp.	50.0
17	Union Texas Petroleum Holdings Inc.	26.2
18	Maxus Energy Corp.	23.2
19	Union Pacific Resources Co.	22.3
20	Union Exploration Partners Ltd.	20.0
	Total	**3,412.4**

tive net income for both fiscal 1986 and fiscal 1987 and an increase in net income for 1987. Subsidiary companies and newly public companies are not included.

In last year's report, only 17 companies of the 400 met the criteria for growth. In fiscal 1987, however, the 20 fastest growing firms were selected from 37 that qualified. Of the companies included in this report, nine are from the top 100, five from the next 100, four from the third 100, and two from the smallest 100 companies.

The list includes many new names, but four companies have appeared before. Exploration Co. of Louisiana was number two on the list last year; Allegheny & Western, Hadson, and Swift Energy have been on the fast-growing roster since 1985.

As the accompanying table shows, most fast growers on this year's list had solid gains in net income and managed to reduce long term debt.

1988 outlook. The recovery in upstream activity that many were looking for in 1988 has been slow to materialize. But dramatically streamlined organizations and refocused operations have made low oil and gas prices bearable.

It's likely that many companies will do better in fiscal 1988 than in 1987 even if the expected recovery continues to be delayed, just because they now have some experience operating in a new market environment.

What seemed impossible 3 years ago now may have become routine.

For companies with large refining operations or petrochemical divisions, this should be a good year. In the U.S., product demand increased 2.8% compared with the first half of 1987 (OGJ, July 25, p. 49), while the average world crude price dropped $2.30/bbl.

Margins will shrink, of course, when higher crude prices make feedstock more costly and tend to dampen demand growth. But margins are still likely to be acceptable, at least as long as utilization rates remain high.

Profits from oil and gas production will be considerably less robust and farther into the future.

Drilling and development plans made in early 1988 were cut back as crude prices failed to increase as expected. In the U.S., natural gas price increases also did not materialize, holding back drilling activity.

Oil & Gas Journal expects U.S. well completions to gain about 9% this year compared with 1987; at the first of the year, operators indicated they would increase drilling by about 16% (OGJ, July 25, p. 64).

Wellhead revenue is expected to be lower than in 1987. But because cost cutting has put many companies in better financial shape, they are expected to invest a slightly larger share of revenue in drilling projects. ■

The top 20 in gas production

Rank	Company name	U.S. gas production, bcf
1	Texaco Inc.	748.0
2	Exxon Corp.	735.0
3	Chevron Corp.	708.0
4	Shell Oil Co.	656.0
5	Amoco Corp.	617.0
6	Mobil Corp.	610.0
7	ARCO	464.0
8	Tenneco Inc.	372.0
9	Unocal Corp.	283.0
10	Occidental Petroleum Corp.	282.0
11	Phillips Petroleum Co.	281.0
12	USX (Oil & Gas Segment)	274.5
13	Sun Co.	230.0
14	Conoco Inc.	219.0
15	Meridian Oil Inc.	150.9
16	Union Exploration Partners Ltd.	143.0
17	Enron Corp.	124.1
18	Union Pacific Resources Co.	120.0
19	Consolidated Natural Gas Co.	109.4
20	BP America	105.0
	Total	**7,231.9**

Rank	Company name	World gas production, bcf
1	Exxon Corp.	1,436.0
2	Mobil Corp.	1,429.0
3	Amoco Corp.	1,022.0
4	Texaco Inc.	885.0
5	Chevron Corp.	816.0
6	Shell Oil Co.	665.0
7	ARCO	523.0
8	Unocal Corp.	428.0
9	Phillips Petroleum Co.	407.0
10	Tenneco Inc.	372.0
11	USX (Oil & Gas Segment)	358.8
12	Conoco Inc.	305.0
13	Occidental Petroleum Corp.	298.0
14	Sun Co.	274.0
15	Amerada Hess Corp.	194.0
16	Meridian Oil Inc.	150.9
17	Union Exploration Partners Ltd.	143.0
18	Enron Corp.	129.2
19	Union Pacific Resources Co.	124.9
20	BP America	123.0
	Total	**10,083.8**

Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
1	1	Exxon Corp.	74,042,000	1	83,335,000	1	4,840,000	1	33,626,000	1	7,136,000
2	2	Mobil Corp.	41,140,000	2	56,716,000	3	1,258,000	2	16,783,000	3	2,942,000
3	4	Chevron Corp.	34,465,000	4	29,097,000	6	1,007,000	3	15,780,000	4	2,841,000
4	3	Texaco Inc.[1]	34,388,000	3	35,315,000	400	(4,407,000)	6	9,171,000	6	1,990,000
5	5	Shell Oil Co.	26,937,000	6	21,222,000	5	1,230,000	4	14,842,000	5	2,614,000
6	6	Amoco Corp.	24,827,000	5	22,388,000	2	1,360,000	5	12,107,000	2	2,979,000
7	10	BP America[2]	23,287,000	9	15,562,000	7	564,000	8	5,574,000	7	1,549,000
8	7	ARCO (Atlantic Richfield Co.)	22,670,000	8	17,608,000	4	1,244,000	7	5,878,000	9	1,463,000
9	8	Tenneco Inc.	18,503,000	10	14,957,000	398	(218,000)	11	3,773,000	10	1,291,000
10	9	Occidental Petroleum Corp.	16,739,000	7	17,746,000	12	240,000	10	5,164,000	15	757,000
11	13	Sun Co.	12,580,000	14	9,817,000	9	348,000	9	5,229,000	11	1,176,000
12	11	Phillips Petroleum Co.	12,111,000	12	10,917,000	36	35,000	14	1,617,000	16	750,000
13	12	USX (Oil & Gas Segment)[3]	11,586,000	13	10,074,000	8	[4]447,000	—	NA	12	964,000
14	14	Unocal Corp.	10,062,000	15	9,393,000	17	181,000	13	1,766,000	13	877,000
15	16	Enron Corp.	9,528,812	18	5,915,766	379	(29,296)	15	1,613,460	25	225,942
16	15	Conoco Inc.[5]	9,146,000	11	11,097,000	10	[6]277,000	—	NA	8	1,480,000
17	17	Coastal Corp.	7,989,300	16	7,536,000	19	115,100	26	859,800	35	172,300
18	18	Columbia Gas System Inc.	5,426,776	21	2,830,410	20	111,334	17	1,573,704	20	298,774
19	20	Amerada Hess Corp.	5,304,808	19	4,784,589	13	229,860	12	2,158,544	17	454,583
20	21	Transco Energy Co.	4,296,912	20	3,250,237	390	(61,311)	35	650,122	22	284,268
21	23	Ashland Oil Inc.[9]	4,058,025	17	7,311,273	18	133,432	22	1,065,399	18	388,932
22	22	Consolidated Natural Gas Co.	3,946,905	25	2,328,907	16	186,047	16	1,598,184	19	359,699
23	27	Enserch Corp.	3,336,470	22	2,820,167	40	30,485	25	958,156	26	215,381
24	25	Pennzoil Co.	3,304,707	26	1,836,302	31	44,256	36	621,274	30	198,668
25	31	Freeport-McMoRan Inc.	3,155,102	28	1,540,885	11	248,751	23	1,022,235	14	808,926
26	26	Sonat Inc.	3,115,015	30	1,498,684	21	105,032	24	1,002,665	32	189,996
27	28	Kerr-McGee Corp.	3,071,000	23	2,639,000	24	81,000	19	1,363,000	24	235,000
28	29	Mesa L.P.	2,680,960	56	352,930	39	31,907	20	[10]1,295,009	65	57,810
29	32	Arkla Inc.	2,524,402	37	1,191,837	25	78,283	30	750,811	34	176,015
30	30	Meridian Oil Inc.[12]	2,268,495	42	735,912	43	27,370	18	1,431,474	47	102,620
31	33	Mitchell Energy & Development Corp.[13]	2,112,139	49	561,882	73	8,755	39	561,895	45	104,529
32	35	Murphy Oil Corp.	2,066,590	29	1,517,638	384	(43,638)	31	750,066	38	162,932
33	34	Nicor Inc.	1,999,961	31	1,439,002	22	83,735	40	550,151	41	144,251
34	24	Maxus Energy Corp.[14]	1,900,500	43	691,000	399	(539,600)	61	197,000	31	197,500
35	37	Union Pacific Resources Co.[15]	1,883,000	33	1,421,000	15	206,000	33	704,000	29	208,000
36	38	Montana Power Co.	1,862,896	46	629,350	27	62,427	28	800,412	55	79,058
37	39	American Petrofina Inc.	1,635,889	24	2,510,411	23	83,284	32	731,281	27	215,103
38	36	Union Texas Petroleum Holdings Inc.	1,632,773	36	1,257,903	28	55,942	78	132,646	33	188,821
39	42	Louisiana Land & Exploration Co.	1,607,100	40	828,400	48	24,800	38	586,700	28	211,100
40	43	Union Exploration Partners Ltd.[17]	1,554,600	44	684,300	14	207,000	21	[10]1,226,700	36	165,800
41	46	Primark Corp.	1,491,060	34	1,370,673	327	(1,727)	45	426,959	52	81,751
42	45	Cabot Corp.[9]	1,463,132	32	1,436,485	42	28,694	37	590,741	51	94,813
43	48	Anadarko Petroleum Corp.	1,430,486	62	230,746	71	9,084	44	427,123	44	119,634
44	47	Global Marine Inc.	1,386,900	94	94,300	395	(131,500)	381	(49,700)	137	8,600
45	44	BHP Petroleum (Americas) Inc.[18,19]	1,358,004	65	209,402	38	33,332	74	146,322	82	37,475
46	53	Enserch Exploration Partners Ltd.[20]	1,180,733	63	225,082	29	51,779	27	[10]847,655	39	147,551
47	50	National Fuel Gas Co.[9]	1,119,374	41	743,067	32	42,492	47	393,490	43	127,303
48	49	Transco Exploration Partners Ltd.[21]	1,107,308	61	272,948	371	(13,579)	34	[10]673,443	48	101,898
49	62	Freeport-McMoRan Energy Partners Ltd.[22]	1,105,427	78	147,919	67	13,508	29	[10]790,948	61	69,807
50	60	Santa Fe Energy Co.[23]	[24]1,057,500	57	331,200	30	[25]46,500	—	NA	21	[24]293,100
51	52	Questar Corp.	1,046,747	50	497,359	46	25,930	42	472,217	50	97,861

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
1	637.0	1	1,436.0	1	6,634.0	1	22,365.0	2	276.0	2	735.0	4	2,634.0	2	9,761.0	7	374.0
7	227.0	2	1,429.0	8	2,397.0	2	20,287.0	8	112.0	6	610.0	8	1,024.0	3	7,741.0	3	646.0
3	329.0	5	816.0	2	3,348.0	4	9,444.0	6	185.0	3	708.0	5	1,809.0	4	7,078.0	9	283.0
2	355.0	4	885.0	3	3,089.0	5	7,847.0	5	197.0	1	748.0	7	1,603.0	7	4,783.0	2	699.0
8	214.0	6	665.0	6	2,915.0	5	6,914.0	4	204.0	4	656.0	3	2,782.0	5	6,541.0	1	1,266.0
5	291.0	3	1,022.0	7	2,580.0	3	15,400.0	7	142.0	5	617.0	6	1,670.0	1	10,690.0	4	629.0
4	310.0	20	123.0	5	3,026.0	11	3,890.0	1	309.0	20	105.0	1	2,953.0	17	1,932.0	17	122.0
6	266.0	7	523.0	4	3,041.0	7	6,751.0	3	243.0	7	464.0	2	2,818.0	6	5,854.0	10	272.0
15	55.00	10	372.0	16	407.0	13	2,946.0	13	39.00	8	372.0	14	270.0	11	2,943.0	23	82.90
10	110.0	13	298.0	14	736.0	14	2,932.0	15	26.00	10	282.0	16	222.0	13	2,734.0	13	189.9
14	77.00	14	274.0	13	763.0	16	2,696.0	10	59.00	13	230.0	10	621.0	15	2,232.0	5	453.0
12	91.00	9	407.0	10	909.0	9	5,285.0	12	51.00	11	281.0	12	457.0	9	3,369.0	14	159.0
13	79.68	11	358.8	12	798.0	10	4,746.4	11	57.99	12	274.5	11	620.8	10	3,277.6	6	428.0
11	97.00	8	428.0	11	897.0	8	6,093.0	9	63.00	9	283.0	9	656.0	8	4,399.0	11	266.0
39	4.533	18	129.2	36	42.31	23	1,424.1	37	3.729	17	124.1	30	36.34	20	1,359.9	35	48.30
9	132.0	12	305.0	9	1,031.0	12	3,200.0	14	39.00	14	219.0	13	351.0	16	1,959.0	16	127.7
42	4.011	35	[7]67.63	47	25.96	26	[7]1,068.0	36	4.011	33	[7]67.63	39	25.96	24	[7]1,068.0	55	[8]24.30
59	2.199	33	75.87	61	14.13	32	882.1	60	1.597	31	73.85	76	7.732	29	732.7	—	NA
16	50.00	15	194.0	15	471.0	18	2,018.0	16	25.00	22	103.0	17	201.0	27	771.0	49	30.00
40	4.394	36	67.01	54	18.07	46	399.1	34	4.394	34	67.01	46	18.07	42	399.1	61	22.00
25	13.70	76	14.50	32	54.60	72	198.4	85	0.900	68	14.50	134	2.800	63	198.4	37	43.00
38	4.725	23	109.6	42	30.85	24	1,208.0	35	4.339	19	109.4	36	26.98	22	1,207.0	8	289.9
49	3.099	34	73.47	45	27.16	27	1,054.9	47	2.706	32	73.47	43	23.62	25	1,054.1	20	94.90
27	11.00	24	108.0	20	137.0	30	903.0	22	11.00	23	103.0	19	135.0	26	821.0	26	72.30
30	8.200	31	79.10	29	76.60	28	978.7	24	8.000	30	74.90	25	71.10	31	701.9	38	42.95
56	2.618	49	39.80	85	7.419	70	205.7	49	2.618	46	39.80	79	7.419	61	205.7	66	19.35
26	13.90	29	87.30	25	89.60	35	712.9	25	6.700	29	77.40	32	33.90	36	563.8	50	29.43
31	6.600	26	104.6	26	89.52	19	1,920.6	26	6.600	21	104.6	21	[11]89.52	18	[11]1,920.6	29	67.00
142	0.276	40	55.00	121	4.497	36	704.1	140	0.276	37	55.00	112	4.497	30	704.1	31	55.30
28	9.672	16	150.9	28	84.40	15	2,807.0	23	9.672	15	150.9	23	84.40	12	2,807.0	21	90.50
24	14.10	43	48.00	27	86.70	41	549.5	20	14.10	40	48.00	22	86.70	37	549.5	33	50.22
22	17.90	37	66.50	23	107.0	37	632.7	28	5.800	38	54.80	34	29.80	45	321.1	45	34.50
81	1.100	69	16.60	102	6.200	94	104.9	74	1.100	64	16.60	92	6.200	82	104.9	97	8.500
18	23.24	22	111.6	21	134.2	33	881.9	33	4.587	24	99.73	29	38.45	28	744.2	25	73.90
19	22.30	19	124.9	18	144.6	22	1,474.1	17	21.20	18	120.0	20	130.0	21	1,355.0	27	70.00
110	[16]0.583	70	[16]16.08	119	[16]4.634	48	[16]349.9	129	[16]0.344	93	[16]7.749	158	[16]1.901	72	[16]134.8	64	[16]20.74
34	5.794	59	28.47	41	31.21	56	291.7	29	5.794	56	28.47	33	31.21	49	291.7	43	35.20
17	26.22	21	119.4	22	109.6	21	1,581.7	38	3.634	43	43.86	42	23.71	44	331.7	36	45.83
23	15.80	25	107.7	24	94.10	34	819.3	21	11.30	27	88.00	26	56.10	34	590.2	46	31.00
20	20.00	17	143.0	17	227.0	17	2,524.0	18	20.00	16	143.0	15	227.0	14	2,524.0	34	50.00
193	0.125	127	3.866	382	0.017	162	24.72	191	0.125	124	3.866	380	0.017	157	24.72	—	—
72	1.351	53	35.37	78	8.057	44	494.6	66	1.351	50	35.37	72	8.057	40	494.6	24	78.40
43	3.914	27	95.91	53	19.45	20	1,772.0	40	3.466	25	94.36	50	15.37	19	1,717.1	30	66.80
137	0.322	191	1.300	166	1.789	132	43.50	133	0.322	188	1.300	162	1.789	127	43.50	148	2.660
35	5.101	52	35.51	30	71.22	39	600.7	31	5.101	49	35.51	24	71.22	33	600.7	52	25.00
54	2.668	30	84.06	51	22.70	25	1,200.5	48	2.668	28	84.06	44	22.70	23	1,200.5	19	108.3
154	0.213	79	13.11	71	10.80	82	134.8	151	0.213	71	13.11	64	10.80	71	134.8	22	85.00
33	5.949	28	90.73	49	24.47	42	540.3	27	5.949	26	90.73	41	24.47	38	540.3	62	22.00
51	2.945	41	53.02	34	45.42	40	588.3	45	2.945	39	53.02	28	45.42	35	588.3	41	38.32
21	19.10	56	29.50	19	139.3	66	217.2	19	19.10	54	29.50	18	139.3	57	217.2	15	151.0
48	3.178	57	30.28	57	[16]15.76	43	[16]509.0	43	3.178	53	30.28	48	[16]15.76	39	[16]509.0	67	19.00

Rank by total assets			Total assets	Total revenue		Net income		Stockholders' equity		Capital & Expl. spending	
1987	1986	Company	$000	Rank	$000	Rank	$000	Rank	$000	Rank	$000
52	57	Total Petroleum (North America) Ltd.	1,014,053	27	1,747,009	378	(26,823)	53	308,296	42	131,941
53	51	Ocean Drilling & Exploration Co.[26]	997,840	54	390,084	394	(129,325)	41	476,217	73	47,638
54	54	Equitable Resources Inc.	974,864	53	408,274	33	41,078	43	453,757	56	77,760
55	61	Hamilton Oil Corp.	955,370	58	320,881	55	21,905	49	349,458	75	41,988
56	56	Oneok Inc.[27]	919,167	47	587,013	57	19,362	51	323,651	72	49,200
57	55	Grace Natural Resources Group[28]	[29]917,000	55	388,200	52	[25]22,400	—	NA	96	23,000
58	64	Diversified Energies Inc.	794,310	45	657,742	44	27,232	58	258,996	60	71,720
59	59	Zapata Corp.[9]	766,157	76	151,363	396	(155,865)	372	(10,508)	88	31,935
60	—	Newmont Oil Co.[30]	755,551	88	105,903	35	[29]35,177	—	NA	100	20,541
61	63	Reading & Bates Corp.[31]	742,407	66	198,442	397	(191,094)	382	(66,525)	120	12,793
62	69	CENEX (Farmer's Union Central Exchange)[8]	639,130	38	1,138,492	128	1,236	55	281,479	159	5,627
63	66	Unimar Co.	628,732	70	176,575	383	(40,035)	63	[32]193,166	91	28,197
64	70	Quaker State Corp.	612,562	39	859,696	387	(48,057)	52	320,330	53	79,396
65	73	Tesoro Petroleum Corp.[9]	577,628	35	1,320,236	329	(1,776)	65	186,724	110	18,322
66	74	Helmerich & Payne Inc.[9]	571,348	73	153,915	54	22,016	46	420,833	67	54,170
67	72	Pogo Producing Co.	565,507	80	141,146	65	16,432	296	1,474	93	26,054
68	71	Noble Affiliates Inc.	516,793	68	189,570	64	16,447	64	192,403	70	52,607
69	65	Apache Corp.	504,333	92	102,091	391	(71,035)	79	128,780	87	32,016
70	96	Triton Energy Corp.[19]	483,761	89	105,865	375	(23,480)	68	176,942	23	242,186
71	78	Forest Oil Corp.	474,462	84	115,342	80	6,278	100	83,601	71	50,491
72	68	Apache Petroleum Co. L.P.[33]	473,468	72	155,499	393	(101,181)	66	[10]185,768	89	30,600
73	81	Adobe Resources Corp.	473,458	91	105,374	45	25,971	48	370,450	81	37,666
74	90	Pacific Enterprises Oil & Gas Co.[34]	461,356	74	153,820	37	34,815	59	231,105	40	145,164
75	76	Tidewater Inc.[35]	447,122	71	173,051	389	(56,678)	60	206,150	163	5,376
76	80	Sunshine Mining Co.	445,481	77	150,249	388	(51,771)	69	176,922	111	18,291
77	83	Kaneb Services Inc.	432,234	90	105,514	381	(35,500)	89	92,764	119	13,004
78	88	Santa Fe Energy Partners L.P.[36]	422,500	82	131,200	372	(13,900)	57	[10]262,800	46	103,800
79	94	NRM Energy Co. L.P.	409,963	104	56,282	385	(44,197)	54	[10]289,387	49	98,755
80	79	CSX Oil & Gas Corp.[37]	392,130	86	114,273	76	8,126	72	150,508	79	38,141
81	82	Southern Union Co.	381,764	67	191,580	361	(7,622)	81	111,652	112	18,180
82	84	Diamond Shamrock Offshore Partners L.P.[38]	365,767	83	119,453	370	(11,782)	50	[10]333,700	66	57,561
83	115	Ram industries Inc.[39,35]	338,017	—	—	214	(101)	56	279,560	—	0
84	92	National Cooperative Refinery Assoc.[40]	335,528	48	572,076	41	28,829	73	[41]148,410	123	12,274
85	—	Total Minatome Corp.[42]	306,860	98	70,063	369	(11,022)	76	141,625	37	163,554
86	91	First Mississippi Corp.[40]	296,362	59	295,741	59	18,610	71	158,606	105	19,527
87	97	Dekalb Energy Cos.[43,27]	294,900	101	66,800	51	[44]23,400	—	NA	76	41,000
88	95	Seagull Energy Corp.	291,845	75	152,923	75	8,180	84	108,136	115	15,221
89	93	Sabine Corp.[45]	264,658	100	68,780	360	(7,521)	70	170,864	84	36,407
90	108	Pelto Oil Co.[46]	263,700	108	44,621	72	6,999	67	181,065	80	38,023
91	98	Southwestern Energy Co.	262,817	97	74,408	69	9,810	95	87,158	108	18,764
92	85	Primary Fuels Inc.[47]	256,055	87	113,987	89	[48]4,475	—	NA	68	53,300
93	101	Quinoco Cos.	245,372	96	80,698	81	6,124	62	194,585	201	2,255
94	99	NUI Corp.[9]	241,143	60	289,182	74	8,299	114	54,711	97	22,647
95	100	TGX Corp.	237,065	93	98,594	84	5,744	87	100,273	174	4,618
96	—	Damson Energy Co. L.P.[49]	236,851	95	85,522	392	(93,599)	83	108,510	185	3,390
97	111	Hadson Corp.	228,645	51	433,525	83	5,851	96	85,057	102	20,345
98	104	Allegheny & Western Energy Corp.[40]	205,407	64	223,286	63	17,413	99	84,150	104	19,708
99	103	NOMECO (Northern Michigan Expl. Co.)[50]	204,163	99	69,250	50	23,516	75	143,265	83	37,378
100	107	Norcen Energy Resources Ltd.[51]	203,000	149	18,000	308	(1,000)	—	NA	107	19,000
101	137	Conquest Exploration Co.	199,424	136	22,583	363	(8,381)	80	123,720	127	11,175
102	106	Prairie Producing Co.[52]	184,040	118	32,822	380	(33,484)	383	(114,232)	98	20,812

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
36	4.960	66	17.98	37	39.90	52	339.4	50	2.390	80	10.57	68	9.970	101	74.67	99	7.900
29	8.357	45	45.76	38	39.16	57	289.8	41	3.320	42	43.92	55	12.86	56	231.7	74	15.99
82	1.085	48	39.86	77	8.381	38	603.5	75	1.085	45	39.86	70	8.381	32	603.5	18	109.0
57	2.486	42	49.96	31	69.73	31	894.0	131	0.334	109	5.712	130	2.979	143	31.86	234	0.250
107	0.618	77	14.08	133	3.240	92	108.7	100	0.618	69	14.08	125	3.240	80	108.7	71	16.63
76	1.227	60	24.91	87	7.374	73	189.8	70	1.204	57	24.22	81	7.241	64	178.6	86	11.20
115	0.501	63	19.70	139	2.913	84	129.2	110	0.501	60	19.70	132	[11]2.913	73	[11]129.2	91	9.550
161	0.200	84	11.70	157	2.100	83	131.0	206	0.100	82	10.40	191	1.100	83	101.5	—	—
69	1.460	54	32.11	83	7.561	62	250.7	62	1.408	66	15.12	96	5.783	105	62.55	153	2.310
91	0.905	98	8.043	90	6.834	96	98.00	95	0.718	92	8.043	84	6.834	86	98.00	124	4.540
64	1.914	196	1.220	69	11.79	230	7.132	57	1.914	193	1.220	61	11.79	227	7.132	88	10.00
61	2.096	32	79.07	56	16.24	29	967.0	73	1.110	83	9.711	107	4.878	104	64.27	107	6.700
88	0.946	121	4.595	82	7.685	111	60.37	82	0.946	116	4.595	77	7.685	106	60.37	28	67.80
68	1.497	135	3.539	129	3.746	118	52.57	106	0.553	132	3.534	136	2.757	163	23.33	150	2.530
90	0.941	85	11.59	86	7.406	60	271.2	84	0.941	77	11.59	80	7.406	51	271.2	114	5.200
50	3.095	56	30.32	52	20.81	51	344.1	44	3.095	52	30.32	45	20.27	53	254.4	85	11.90
45	3.861	39	58.66	43	30.08	53	331.4	39	3.533	36	57.72	37	26.42	46	316.6	54	24.39
63	2.008	46	40.89	70	11.30	61	270.0	56	2.008	44	40.89	63	11.30	52	270.0	77	14.96
41	4.374	64	19.70	35	43.48	65	219.6	98	0.664	117	4.567	123	3.313	138	35.14	120	4.940
103	0.679	47	40.78	106	5.893	49	345.9	103	0.581	47	39.26	121	3.432	49	272.4	111	5.800
46	3.274	38	64.76	60	14.68	55	312.2	42	3.274	35	64.76	51	14.68	47	312.2	96	8.630
47	3.238	68	17.76	40	33.13	63	248.1	55	2.050	63	17.76	38	26.28	54	248.1	102	7.390
32	6.295	61	23.19	33	52.38	75	167.3	30	5.524	58	21.25	27	[11]52.38	66	[11]167.3	12	206.1
65	1.684	234	0.640	101	6.234	294	2.317	378	0.001	338	0.065	381	0.015	373	0.221	—	NA
79	1.126	74	14.90	96	6.440	79	142.6	76	1.076	72	12.53	99	5.550	89	86.91	121	4.870
95	0.852	86	11.04	125	4.002	109	74.21	89	[11]0.852	78	[11]11.04	116	[11]4.002	102	[11]74.21	72	16.30
37	4.800	55	31.60	44	29.80	67	211.9	32	4.800	51	31.60	35	29.80	58	211.9	32	51.50
85	1.026	65	18.02	67	12.13	78	146.8	79	1.026	61	18.02	59	12.13	68	146.8	—	NA
55	2.625	51	37.95	58	15.68	47	367.5	52	2.153	48	37.95	56	12.75	55	232.5	75	15.03
151	0.227	133	3.658	162	1.955	103	83.99	148	0.227	130	3.658	157	1.955	93	83.99	104	7.000
67	1.553	44	47.18	65	12.48	68	211.4	61	1.553	41	47.18	57	12.48	59	211.4	110	6.200
—	—	—	—	59	15.60	45	460.0	—	—	—	—	49	15.60	41	460.0	—	—
73	1.343	136	3.379	92	6.753	135	41.64	67	1.343	135	3.379	86	6.753	130	41.64	47	31.00
62	2.080	67	17.81	64	12.88	76	157.7	54	2.080	62	17.81	54	12.88	67	157.7	78	14.77
127	0.389	97	8.061	170	1.620	140	37.91	119	0.389	91	8.061	166	1.620	135	37.91	100	7.700
52	2.800	73	15.00	46	26.70	54	322.5	58	1.800	102	6.300	62	11.60	118	49.80	53	25.00
317	0.020	107	6.351	357	0.058	150	29.19	313	0.020	101	6.351	352	0.058	145	29.19	142	3.090
60	2.100	81	12.30	66	12.40	90	113.7	53	2.100	74	12.30	58	12.40	84	101.5	51	27.78
97	0.843	72	15.51	88	7.195	80	137.6	91	0.843	65	15.51	82	7.195	69	137.6	73	16.10
155	0.211	90	9.420	210	0.888	69	210.5	152	0.211	84	9.420	206	0.888	60	210.5	60	22.20
44	3.887	50	39.17	50	23.51	58	281.7	59	1.626	55	29.12	65	10.59	77	121.7	70	17.00
58	2.280	62	20.66	68	11.83	71	201.6	51	2.280	59	20.66	60	11.83	62	201.6	184	1.000
225	0.085	220	0.856	288	0.281	246	4.958	223	0.085	215	0.856	284	0.281	244	4.958	183	1.100
167	0.186	125	4.200	147	2.478	74	169.0	164	0.186	121	4.200	144	2.478	65	169.0	174	1.320
70	1.419	89	9.674	81	7.768	86	124.7	64	1.383	86	9.080	75	7.768	74	124.7	268	0.015
130	0.380	105	6.728	172	1.599	141	37.57	124	0.380	99	6.728	168	1.599	136	37.57	94	8.900
384	0.001	177	1.600	373	0.028	154	27.81	384	0.001	174	1.600	370	0.028	149	27.81	42	36.04
66	1.600	82	12.10	93	6.700	101	85.30	63	1.394	75	12.10	101	5.502	95	81.37	80	14.48
121	0.457	120	4.598	98	6.378	100	85.81	115	0.457	115	4.598	89	6.378	91	85.81	76	15.00
120	0.465	101	6.906	103	6.094	107	76.80	114	0.465	95	6.906	93	6.094	99	76.80	106	6.900
96	0.850	95	8.719	79	7.877	120	51.40	90	0.850	90	8.719	73	7.877	115	51.40	92	9.000

Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
103	102	Home Petroleum Corp.[53,27]	182,517	112	38,418	112	[54]1,847	—	NA	135	9,053
104	125	Snyder Oil Partners L.P.	169,235	106	48,516	85	5,400	77	[10]138,609	57	76,446
105	112	Pyro Energy Corp.	161,050	85	115,247	79	6,396	102	77,861	150	6,010
106	129	Global Natural Resources Inc.	157,334	119	32,505	333	(2,209)	91	89,570	92	27,708
107	117	Statex Petroleum Inc.[55]	147,248	117	33,201	87	[25]5,103	—	NA	99	20,668
108	113	Howell Corp.	146,689	69	183,490	117	1,746	116	54,025	168	5,138
109	75	Moore McCormack Energy Inc.[56]	146,209	122	30,663	107	2,316	128	37,036	77	38,887
110	116	Park-Ohio Industries Inc.	145,241	81	134,586	340	(3,076)	101	80,958	184	3,401
111	119	Avalon Corp.	134,710	132	24,689	183	100	85	102,597	85	34,482
112	122	Wainoco Oil Corp.	126,777	115	33,933	49	24,523	107	65,929	116	14,223
113	121	Harken Oil & Gas Inc.	125,111	52	420,905	95	3,209	105	68,345	128	11,001
114	118	Kaneb Energy Partners Ltd.[57]	121,422	105	52,524	68	11,707	104	[10]69,430	147	6,866
115	109	Damson Oil Corp.[9]	120,554	126	29,037	374	(21,496)	251	3,444	212	1,834
116	164	Presidio Oil Co.	119,097	188	[58]9,054	320	[58](1,466)	133	31,095	161	[58]5,573
117	—	Parker & Parsley Development Partners L.P.	117,266	116	33,296	362	(8,092)	82	[10]110,837	106	19,124
118	126	Sage Energy Co.[40]	115,746	129	27,378	343	(3,232)	109	62,994	126	11,636
119	130	Ensource Inc.	111,583	121	30,701	241	(221)	119	48,288	121	12,636
120	131	Wiser Oil Co.	105,628	120	31,805	97	2,952	90	90,498	114	16,020
121	—	NGC Energy Co.[59]	104,998	156	15,484	350	(4,579)	127	38,403	64	65,204
122	128	Noble Drilling Corp.	103,654	128	26,018	366	(10,148)	94	87,329	140	8,047
123	191	Nerco Oil & Gas Inc.[60]	103,200	159	14,100	356	(6,700)	93	88,000	62	69,300
124	133	San Juan Basin Royalty Trust	102,013	146	18,356	61	17,852	86	[61]101,205	—	0
125	—	Prudential-Bache Energy Income L.P. IVP-17	96,998	169	12,201	100	2,691	92	[10]88,104	59	71,858
126	—	Prudential-Bache Energy Income L.P. VP-19	96,463	229	4,614	149	559	88	[10]93,259	54	79,335
127	141	American Exploration Co.[63]	96,094	125	29,687	122	1,491	169	16,253	141	7,830
128	142	Flag Redfern Oil Co.	93,570	123	30,442	93	3,495	106	67,983	109	18,573
129	—	Prudential-Bache Energy Income L.P. IVP-16	93,247	166	13,280	98	2,833	97	[10]84,556	58	71,886
130	139	Integrated Drilling & Exploration Inc.[64]	90,420	139	20,806	220	(127)	98	84,205	153	5,834
131	136	Crystal Oil Co.	89,232	110	40,336	99	2,762	154	21,258	196	2,587
132	138	Consolidated Oil & Gas Inc.[65]	85,953	148	18,026	365	(9,399)	379	(22,620)	228	1,385
133	144	Chieftain Development Co. Ltd.[51,66]	84,218	165	13,365	291	(671)	—	NA	139	8,209
134	120	Kirby Exploration Co. Inc.[67]	82,004	107	47,642	82	6,031	118	49,706	157	5,657
135	165	Plains Resources Inc.	78,856	164	13,514	316	(1,292)	147	24,253	90	[68]29,241
136	145	Tom Brown Inc.[35]	75,253	143	18,959	339	(2,980)	139	28,018	190	3,072
137	—	Prudential-Bache Energy Income L.P. VP-18	74,907	218	5,262	140	860	103	[10]72,098	63	65,588
138	—	Damson Income Energy L.P.[69]	73,716	141	20,405	376	(23,862)	112	[10]58,992	199	2,502
139	—	Berry Petroleum Co.	72,741	103	57,628	58	19,355	113	55,474	160	5,578
140	148	Exploration Co. of Louisiana Inc.	72,435	124	30,190	78	7,570	111	59,001	143	7,490
141	159	Beard Co.[70]	70,219	152	16,462	86	5,336	136	29,401	124	12,170
142	169	Patrick Petroleum Co.	69,162	189	9,009	148	562	130	34,173	117	14,063
143	123	Texas American Energy Corp.	67,022	177	10,364	66	15,704	159	18,252	191	2,987
144	135	MCO Resources Inc.	66,062	133	23,389	377	(25,813)	378	(21,730)	263	724
145	—	Damson Institutional Energy L.P.[71]	65,772	138	20,861	373	(20,084)	122	[10]44,062	259	749
146	—	Hutton/Energy Assets 3rd Energy Ptrsp. A Ltd.	64,519	194	7,913	105	2,390	108	[10]63,581	103	20,138
147	—	Apache Offshore Investment Partnership[72]	63,716	235	4,106	368	(10,785)	232	[10]4,624	136	8,680
148	147	Freeport-McMoRan Oil and Gas Royalty Trust	62,857	145	18,386	62	[73]17,635	110	[61]59,221	—	NA
149	150	Pauley Petroleum Inc.[27]	60,222	79	142,042	231	(167)	140	27,688	176	4,221
150	—	Prudential-Bache Energy Income L.P. IIIP-14	59,331	191	8,653	127	1,301	115	[10]54,657	69	53,100
151	153	Equity Oil Co.	56,342	162	13,868	109	2,157	124	40,513	189	3,250
152	140	Unit Corp.	56,066	127	28,888	382	(35,635)	126	40,115	169	5,085
153	151	Houston Oil Trust	53,507	250	3,276	121	[73]1,550	117	[61]53,505	—	NA

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
87	0.969	91	9.403	84	7.559	88	122.8	81	0.969	85	9.403	78	7.559	76	122.8	105	7.000
84	1.030	87	10.85	62	13.84	87	124.4	78	1.030	79	10.85	52	13.84	75	124.4	59	22.73
146	0.255	161	2.312	164	1.828	183	17.02	144	0.255	159	2.312	160	1.828	180	17.02	259	0.080
124	0.406	99	7.600	97	6.406	77	153.0	121	[11]0.383	114	[11]5.125	98	[11]5.564	90	[11]86.13	81	14.40
152	0.226	110	6.013	155	2.169	99	87.99	149	0.226	105	6.013	151	2.169	88	87.99	63	21.90
98	0.823	116	5.534	104	5.954	97	89.99	92	0.817	113	5.318	95	5.818	97	80.42	131	4.120
108	0.614	113	5.883	74	10.22	106	79.77	101	0.614	108	5.883	67	10.22	98	79.77	117	5.000
204	0.110	150	2.687	181	1.458	126	45.13	202	0.110	149	2.687	177	1.458	121	45.13	185	1.000
116	0.498	118	5.515	117	4.670	85	128.7	138	0.293	269	0.288	143	2.497	287	2.553	204	0.500
105	0.656	71	15.88	112	5.172	64	247.6	127	0.365	133	3.497	128	3.009	113	53.34	109	6.290
184	0.143	225	0.763	180	1.461	206	12.11	182	0.143	221	0.763	176	1.461	203	12.11	135	3.570
86	1.001	78	13.38	116	4.774	98	89.90	80	1.001	70	13.38	109	4.774	87	89.90	83	13.90
114	0.528	129	3.767	142	2.724	123	49.65	109	[11]0.528	126	[11]3.767	137	[11]2.724	119	[11]49.65	271	0.004
168	[58]0.181	153	[58]2.628	143	2.713	91	109.2	165	[58]0.181	152	[58]2.628	138	2.713	78	109.2	79	[58]14.77
99	0.793	83	11.81	91	6.769	108	75.52	93	0.793	76	11.81	85	6.769	100	75.52	93	9.000
80	1.114	123	4.449	72	10.50	139	37.96	72	1.114	119	4.449	66	10.50	134	37.96	90	9.600
118	0.481	94	8.767	130	3.599	95	99.17	112	0.481	89	8.767	120	3.599	85	99.17	115	5.150
94	0.876	108	6.216	76	9.235	102	84.36	88	0.876	103	6.216	69	[11]9.235	92	[11]84.36	39	41.00
153	0.215	93	9.020	171	1.604	93	108.5	150	0.215	88	9.020	167	1.604	81	108.5	125	4.500
252	0.056	261	0.374	260	0.386	271	3.268	249	0.056	259	0.374	256	0.386	269	3.268	126	4.500
135	0.337	122	4.538	141	2.794	114	58.88	130	0.337	118	4.538	135	2.794	109	58.88	—	NA
248	0.061	80	12.46	195	1.077	59	272.0	245	0.061	73	12.46	193	1.077	50	272.0	197	[62]0.600
139	0.307	147	2.900	109	5.440	124	47.37	136	0.307	146	2.900	102	5.440	120	47.37	—	—
175	0.164	238	0.583	108	5.533	156	27.34	171	0.164	233	0.583	100	5.533	151	27.34	—	—
100	0.739	104	6.743	118	4.658	116	57.16	94	0.739	98	6.743	110	4.658	111	57.16	138	3.420
89	0.946	112	5.964	89	6.976	138	39.05	83	0.946	107	5.964	83	6.976	133	39.05	68	18.70
140	0.306	152	2.670	105	5.898	128	44.42	137	0.306	151	2.670	94	5.898	123	44.42	—	—
188	0.133	145	3.043	193	1.109	130	43.84	185	0.133	143	3.043	190	1.109	125	43.84	89	10.00
71	1.382	88	10.46	107	5.639	127	45.03	65	1.382	81	10.46	97	5.639	122	45.03	163	1.800
122	0.453	114	5.769	111	5.249	89	121.0	117	0.439	112	5.353	104	5.147	79	109.1	166	1.700
111	0.559	260	0.376	110	5.268	195	14.06	104	0.559	258	0.376	103	5.268	191	14.06	216	0.390
—	NA	—	NA	140	2.811	175	20.51	—	NA	—	NA	133	2.811	172	20.51	—	NA
145	0.258	134	3.601	184	1.395	112	60.23	143	0.258	131	3.601	181	1.395	107	60.23	122	4.780
101	0.702	138	3.236	114	5.066	117	53.91	96	0.702	137	3.236	106	5.066	112	53.91	198	0.600
180	0.150	199	1.193	122	4.264	167	22.66	177	0.150	195	1.193	113	4.264	164	22.66	—	—
126	0.390	143	3.068	148	2.440	137	39.76	123	0.382	145	2.933	145	2.440	132	39.76	—	—
53	2.709	233	0.645	39	34.38	211	10.73	46	2.709	229	0.645	31	34.38	208	10.73	224	0.300
183	0.146	131	3.741	300	0.225	178	19.55	180	0.146	128	3.741	296	0.225	175	19.55	155	2.260
109	0.605	158	2.346	134	3.114	193	14.22	102	0.605	157	2.346	126	3.114	189	14.22	48	30.71
162	0.196	198	1.201	200	0.979	196	14.06	158	0.196	194	1.201	198	0.979	192	14.06	157	2.160
131	0.373	172	1.646	136	2.988	192	14.36	125	0.373	170	1.646	129	2.988	188	14.36	—	—
119	0.475	92	9.067	146	2.595	115	58.13	113	0.475	87	9.067	142	[11]2.595	110	[11]58.13	161	1.960
133	0.364	163	2.310	163	1.859	160	26.19	128	0.355	162	2.160	159	1.859	155	26.19	—	—
212	0.097	170	1.883	229	0.617	131	43.70	209	0.097	168	1.883	227	0.617	126	43.70	—	—
342	0.011	165	2.140	236	0.551	146	33.12	338	0.011	163	2.140	234	0.551	141	33.12	—	NA
150	0.236	100	7.428	262	0.379	170	21.92	147	0.236	94	7.428	258	0.379	167	21.92	—	NA
83	1.043	242	0.537	94	6.538	257	4.385	77	1.043	237	0.537	87	6.538	255	4.385	225	0.300
160	0.201	166	2.018	135	3.095	136	40.21	157	0.201	164	2.018	127	3.095	131	40.21	—	—
104	0.658	231	0.659	75	10.13	148	32.67	107	0.543	246	0.443	71	8.224	148	28.04	154	2.310
164	0.191	151	2.682	192	1.136	169	22.40	161	0.191	150	2.682	189	1.136	166	22.40	84	11.91
125	[74]0.391	128	[74]3.789	178	[74]1.507	159	[74]26.61	118	[74]0.391	125	[74]3.789	173	[74]1.507	154	[74]26.61	—	NA

Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
154	187	**Calumet Industries Inc.[9]**	53,317	111	38,732	336	(2,266)	168	16,555	101	20,437
155	—	**Prudential-Bache Energy Income L.P. IIIP-15**	51,167	201	7,552	134	1,060	120	[10]47,132	74	43,478
156	179	**Bogert Oil Co.[9]**	49,394	147	18,183	115	1,754	158	19,390	133	9,725
157	—	**Prudential-Bache Energy Income L.P. IIIP-12**	48,971	176	10,372	94	3,426	121	[10]44,082	94	25,722
158	170	**Thermal Exploration Co.[76,9]**	48,842	222	[77]5,119	266	[48](349)	—	NA	129	10,840
159	105	**Texas International Co.**	48,666	113	35,924	386	(44,222)	384	(143,172)	113	16,159
160	143	**Graham-McCormick Oil & Gas Partnership[78]**	48,650	155	15,745	353	(5,597)	351	[19](23)	295	379
161	160	**Wilshire Oil Co. of Texas**	47,503	186	9,198	145	619	181	12,345	183	3,435
162	—	**PaineWebber/Geodyne Energy Income L.P. II-A**	44,603	260	2,787	151	515	123	[10]43,048	95	25,326
163	—	**Clinton Gas Systems Inc.[79]**	44,469	109	42,830	177	160	157	19,436	187	3,282
164	171	**Fuel Resources Inc.[80,9]**	44,369	175	10,414	169	220	167	16,776	131	10,067
165	158	**Alamco Inc.**	42,734	179	10,184	346	(3,448)	243	3,901	—	NA
166	178	**Wolverine Exploration Co.[81]**	42,189	182	9,906	26	77,851	162	17,926	78	38,404
167	167	**Pend Oreille Oil & Gas Co.[82]**	42,105	137	21,023	120	1,607	144	25,521	155	5,708
168	155	**OKC L.P.**	41,567	114	35,137	77	7,909	138	[10]29,142	—	NA
169	156	**Ethyl Corp. (Oil & Gas Division)**	41,567	157	14,385	110	[8]1,900	—	NA	118	13,257
170	198	**Kelley Oil & Gas Partners Ltd.[83]**	41,490	181	10,066	141	839	125	[10]40,376	126	12,091
171	157	**General Energy Development Ltd.[84]**	41,412	144	18,894	180	107	137	[10]29,381	204	1,979
172	212	**Oregon Natural Gas Development Corp.[85]**	41,343	198	7,740	244	(240)	141	26,583	145	7,278
173	166	**Oil Industries Inc.[36]**	40,278	212	5,656	111	1,863	179	12,504	297	365
174	168	**Fuel Resources Development Co.[86]**	39,857	199	7,607	144	640	153	21,689	180	3,975
175	172	**Maynard Oil Co.**	39,448	154	15,901	136	996	134	29,952	205	1,958
176	180	**Samson Energy Co.**	38,724	187	9,090	154	472	149	[10]22,971	156	5,693
177	—	**Prudential-Bache Energy Income L.P. IIIP-13**	38,455	214	5,587	132	1,091	129	[10]35,354	86	34,025
178	—	**Callon Consolidated Partners L.P.[87]**	37,719	151	16,776	135	1,029	135	[10]29,482	277	573
179	184	**Oxoco Inc.**	37,499	170	11,996	205	(50)	176	12,760	226	1,503
180	183	**Penn Virginia Resources Corp.[88]**	36,662	185	9,250	108	[89]2,215	—	NA	132	9,727
181	182	**Chapman Energy Inc.[40]**	36,571	213	[89]5,624	101	[89]2,667	304	1,301	360	33
182	202	**McFarland Energy Inc.**	35,934	167	13,103	103	2,553	142	26,113	134	9,485
183	188	**Enex Resources Corp.**	34,758	174	11,231	153	480	132	31,270	215	1,653
184	177	**Devon Resource Investors L.P.**	34,616	180	10,072	347	(3,598)	150	[10]22,545	179	4,060
185	190	**Plains Petroleum Co.**	33,069	131	24,789	70	9,130	146	24,458	172	5,010
186	185	**Tipperary Corp.[9]**	32,659	142	19,387	60	18,555	374	(11,634)	289	445
187	—	**PaineWebber/Geodyne Energy Income L.P. II-B**	32,240	363	418	191	34	131	[10]32,058	182	3,629
188	228	**Saxon Oil Co.**	31,686	168	12,535	129	1,139	160	18,251	193	2,674
189	207	**Coho Resources Inc.[91]**	31,595	210	5,784	92	4,014	300	1,406	151	5,981
190	206	**Fidelity Oil Co.[92]**	31,031	204	7,066	88	4,640	156	21,050	149	6,116
191	176	**Alexander Energy Corp.[35]**	30,647	233	4,244	349	(3,837)	182	12,344	225	1,504
192	175	**Walker Energy Partners**	29,661	184	9,365	364	(8,840)	237	[10]4,322	249	866
193	189	**Dominex U.S. Oil Co.[93]**	29,230	153	15,986	314	(1,173)	205	7,206	213	1,768
194	201	**Saxon Oil Development Partners L.P.[94]**	28,767	171	11,884	123	1,464	148	[10]23,251	197	2,510
195	194	**Federated Natural Resources Corp.**	28,715	197	7,747	321	(1,473)	246	3,857	192	2,922
196	205	**MSR Exploration Ltd.[66]**	28,529	240	3,924	242	(221)	152	21,960	214	1,734
197	197	**Equitable Petroleum Corp.**	28,484	234	4,241	249	(253)	210	6,826	321	159
198	—	**Prudential-Bache Energy Income L.P. IIP-8**	28,336	195	7,848	119	1,623	145	[10]25,517	138	8,553
199	—	**Consolidated Energy Partners L.P.[76,95]**	27,942	206	6,696	392	(5,341)	375	[10](19,509)	334	110
200	199	**Petroleum Development Corp.**	27,870	172	11,807	172	184	189	9,806	244	1,061
201	—	**Nucorp Energy Inc.**	27,323	158	14,198	173	184	178	12,560	209	1,883
202	186	**Convest Energy Partners Ltd.[96]**	26,178	178	10,323	296	(728)	186	[10]20,479	202	2,104
203	192	**LL&E Royalty Trust**	25,989	134	23,224	53	[72]22,190	143	[61]25,989	—	NA
204	211	**Belden & Blake Energy Co.**	25,452	193	6,030	298	(747)	184	[10]17,316	148	6,743

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
249	0.059	—	—	279	[75]0.322	—	—	246	0.059	—	—	275	[75]0.322	—	—	—	—
170	0.174	171	1.739	144	2.635	144	34.53	166	0.174	169	1.739	139	2.635	139	34.53	—	—
141	0.278	117	5.519	145	2.598	121	51.27	139	0.278	111	5.519	141	2.598	116	51.27	58	22.90
210	0.099	149	2.804	174	1.576	113	59.24	208	0.099	148	2.804	170	1.576	108	59.24	—	—
182	0.147	190	1.317	202	0.958	180	18.51	179	0.147	187	1.317	200	0.958	177	18.51	—	NA
78	1.174	185	1.379	73	10.48	286	2.578	181	0.145	238	0.535	211	0.839	284	2.578	103	7.230
173	0.165	103	6.793	213	0.860	122	50.80	169	0.165	97	6.793	209	0.860	117	50.80	—	NA
148	0.249	160	2.313	153	2.297	151	29.15	160	0.192	176	1.540	179	1.430	196	13.71	—	NA
279	0.037	215	0.948	165	1.790	185	16.82	274	0.037	210	0.948	161	1.790	182	16.82	—	NA
221	0.087	169	1.920	272	0.331	197	14.03	219	0.087	167	1.920	268	0.331	193	14.03	—	NA
230	0.081	157	2.385	257	0.427	176	20.19	228	0.081	156	2.385	253	0.427	173	20.19	—	NA
274	0.039	155	2.503	271	0.336	164	23.99	270	0.039	154	2.503	267	0.336	160	23.99	239	0.200
149	0.240	154	2.508	355	0.063	—	—	146	0.240	153	2.508	350	[11]0.063	—	—	65	19.40
132	0.369	102	6.903	188	1.310	166	23.71	126	0.369	96	6.903	185	1.310	162	23.71	116	5.100
77	1.192	124	4.262	120	4.516	119	52.05	71	1.192	120	4.262	111	4.516	114	52.05	229	0.280
134	0.357	119	5.306	137	2.985	125	47.25	135	0.309	123	4.084	140	2.624	159	24.15	147	2.700
241	0.069	115	5.691	240	0.533	105	80.42	239	0.069	110	5.691	238	0.533	96	80.42	172	1.370
123	0.440	111	6.003	151	2.308	149	30.99	116	0.440	106	6.003	148	2.308	144	30.99	190	0.900
—	NA	291	0.197	—	NA	337	0.902	—	NA	290	0.197	—	NA	335	0.902	—	—
327	0.016	247	0.476	318	0.168	247	4.928	323	0.016	244	0.476	314	0.168	245	4.928	261	0.070
199	0.121	156	2.443	225	0.649	110	71.64	197	0.121	155	2.443	223	0.649	103	71.64	132	4.000
144	0.264	164	2.280	175	1.567	172	21.29	142	0.264	161	2.280	171	1.567	169	21.29	232	0.266
254	0.054	130	3.754	256	0.438	155	27.38	251	0.054	127	3.754	252	0.438	150	27.38	127	4.420
190	0.129	193	1.285	161	1.964	161	25.77	187	0.129	190	1.285	156	1.964	156	25.77	—	—
106	0.635	148	2.841	123	4.159	199	13.87	99	0.635	147	2.841	114	4.159	195	13.87	214	0.400
178	0.156	140	3.167	198	1.011	181	18.39	175	0.156	139	3.167	196	1.011	178	18.39	213	0.410
318	0.019	167	2.000	283	0.300	129	44.00	314	0.019	165	2.000	279	0.300	124	44.00	—	NA
238	[90]0.075	211	[90]1.033	224	0.652	210	10.78	236	[90]0.075	206	[90]1.033	222	0.652	207	10.78	255	[90]0.100
102	0.700	195	1.268	80	7.828	234	6.182	97	0.700	192	1.268	74	7.828	232	6.182	98	8.300
147	0.255	162	2.312	183	1.418	186	16.82	145	0.255	160	2.312	180	1.418	183	16.82	265	0.028
231	0.081	132	3.702	246	0.509	147	32.78	229	0.081	129	3.702	243	0.509	142	32.78	146	2.775
239	0.072	75	14.62	282	0.317	50	345.5	237	0.072	67	14.62	278	0.317	43	345.5	56	23.00
129	0.383	183	1.445	127	3.804	158	27.13	122	0.383	181	1.445	118	3.804	153	27.13	230	0.270
355	0.008	—	—	215	0.806	—	—	352	0.008	—	—	212	0.806	—	—	—	NA
112	0.555	173	1.641	113	5.096	189	16.22	105	0.555	171	1.641	105	5.096	186	16.22	264	0.040
136	0.327	359	0.040	48	24.81	288	2.554	132	0.327	358	0.040	40	24.81	286	2.554	87	11.13
75	1.304	240	0.570	63	13.00	340	0.800	69	1.289	236	0.542	53	12.90	341	0.700	40	41.00
223	0.086	178	1.551	185	1.364	171	21.79	221	0.086	175	1.551	182	1.364	168	21.79	130	4.195
181	0.148	137	3.303	189	1.215	163	24.43	178	0.148	136	3.303	186	1.215	158	24.43	256	0.100
—	NA	144	3.050	99	6.242	174	20.54	—	NA	142	3.050	90	6.242	171	20.54	129	4.200
113	0.529	176	1.603	115	4.853	190	15.72	108	0.529	173	1.603	108	4.853	187	15.72	245	0.180
174	0.165	192	1.296	247	0.484	209	11.55	170	0.165	189	1.296	244	0.484	206	11.55	209	0.480
176	0.160	315	0.107	132	3.254	255	4.473	172	0.160	314	0.107	124	[11]3.254	253	[11]4.473	—	NA
202	0.111	226	0.760	126	3.869	153	28.40	200	0.111	222	0.760	117	3.869	147	28.40	—	NA
185	0.143	159	2.322	220	0.741	157	27.33	183	0.143	158	2.322	218	0.741	152	27.33	—	NA
201	0.115	141	3.146	176	1.539	164	83.95	199	0.115	140	3.146	172	1.539	94	83.95	243	0.188
319	0.019	229	0.705	307	0.203	168	22.52	315	0.019	225	0.705	303	0.203	165	22.52	133	3.730
117	0.491	168	1.950	124	4.098	194	14.21	111	0.491	166	1.950	115	4.098	190	14.21	180	1.170
138	0.311	175	1.612	149	2.429	203	12.67	134	0.311	172	1.612	146	2.429	200	12.67	211	0.430
92	[97]0.897	142	[97]3.069	128	[97]3.763	198	[97]13.95	86	[97]0.897	141	[97]3.069	119	[97]3.763	194	[97]13.95	226	0.300
143	0.276	180	1.505	138	2.927	194	16.94	141	0.276	178	1.505	131	2.927	161	16.94	167	1.700

Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
205	—	ICG Petroleum Inc.[98]	25,399	251	3,158	150	543	161	18,214	355	43
206	—	Prudential-Bache Energy Income L.P. IIP-10	25,044	215	5,428	114	1,811	151	[10]22,418	122	12,331
207	163	Amax Oil & Gas Inc.	24,364	140	20,557	34	40,797	183	12,013	173	4,923
208	208	Mustang Resources Corp.[99,13]	23,913	205	6,836	306	(986)	195	9,083	210	1,879
209	222	Swift Energy Co.	23,746	173	11,698	91	4,024	184	10,871	220	1,573
210	218	Taurus Exploration Inc.[100,9]	23,205	183	9,536	118	1,725	190	9,650	146	7,088
211	203	KenCope Energy Cos.[40]	22,783	163	13,616	357	(6,502)	177	12,563	261	733
212	225	Barrett Resources Corp.[9]	21,281	238	4,087	290	(656)	171	15,213	171	5,041
213	195	Petroleum Investments Ltd.	21,038	200	7,579	359	(7,150)	193	[10]9,545	282	513
214	209	Baruch-Foster Corp.	20,886	190	8,781	294	(713)	180	12,391	186	3,389
215	—	American National Petroleum Co.	20,276	207	6,406	267	(354)	185	10,686	236	1,131
216	—	Prudential-Bache Energy Income L.P. IIP-11	19,993	237	4,089	125	1,334	163	[10]17,922	130	10,155
217	216	Hershey Oil Corp.	19,408	216	5,402	187	71	174	13,824	195	2,613
218	210	Tucker Drilling Co. Inc.[35]	18,675	192	8,545	318	(1,386)	165	17,233	211	1,875
219	—	Bridge Oil (USA) Inc.[101]	17,761	262	2,700	137	967	200	7,851	227	1,502
220	244	Geodyne Resources Inc.[102]	17,621	160	14,017	90	4,463	207	7,113	262	729
221	—	Columbian Energy Co. L.P.	17,580	268	2,382	334	(2,223)	166	[10]17,024	290	439
222	—	Prudential-Bache Energy Income L.P. IIP-9	17,496	227	4,759	138	965	170	[10]15,790	166	5,177
223	215	Resource Exploration Inc.[9]	16,994	217	5,330	147	589	172	15,160	260	749
224	272	Petromark Resources Co.	15,804	221	5,191	345	(3,297)	356	(624)	293	405
225	—	Garnet Resources Corp.	14,703	309	1,052	228	(155)	175	12,998	206	1,956
226	221	Sabine Royalty Trust	14,593	135	23,058	56	21,589	173	[61]14,161	—	NA
227	—	Daleco Resources Corp.[66]	14,018	336	693	332	(2,119)	337	479	344	75
228	253	Belcor Inc.[103]	13,777	161	13,879	143	713	239	4,128	194	2,658
229	154	Callon Petroleum Co.	13,627	211	5,749	331	(2,113)	194	9,203	270	602
230	223	Adams Resources & Energy Inc.	13,602	102	66,367	106	2,317	365	(4,284)	235	1,153
231	200	Quadra Oil & Gas Inc.[104]	13,446	273	2,228	218	(120)	380	(23,527)	158	5,650
232	—	Red Eagle Resources Corp.[9]	13,231	150	17,568	142	777	260	2,897	162	5,570
233	243	Energy Assets International Corp.[36]	13,204	208	6,262	286	(588)	242	3,936	170	5,043
234	251	Texoil Energy Corp.[105]	12,336	281	1,705	356	(6,155)	369	(8,642)	327	136
235	—	Prudential-Bache Energy Income L.P. IIP-7	12,234	230	4,466	131	1,131	186	[10]10,239	280	526
236	230	Michigan Oil Co.[106,40]	12,226	224	4,873	348	[44](3,610)	—	NA	142	7,724
237	—	Prudential-Bache Energy Income L.P. IIP-4	12,150	239	4,006	146	604	188	[10]9,963	—	NA
238	226	Kimbark Oil & Gas Co.	11,899	223	5,055	300	(852)	264	2,517	322	157
239	231	Premier Resources Ltd.[9]	11,788	258	2,856	206	(54)	361	(1,926)	302	299
240	235	Home-Stake Royalty Corp.	11,668	220	5,216	116	1,752	187	10,174	221	1,571
241	—	Prudential-Bache Energy Income L.P. IIP-5	11,315	255	2,998	160	315	191	[10]9,592	352	50
242	239	Energy Management Corp.[27]	11,292	247	[107]3,383	193	[107]29	226	5,071	312	214
243	238	Vermilion Bay Land Co.	11,043	248	3,306	171	187	192	9,561	223	1,537
244	—	Prudential-Bache Energy Income L.P. IIP-6	10,751	228	4,652	133	1,088	197	[10]8,810	375	7
245	245	Dorchester Hugoton Ltd.	10,733	243	3,790	124	1,442	196	[10]9,063	301	314
246	236	Evergreen Resources Inc.[35]	10,710	322	820	328	(1,734)	219	5,616	217	1,628
247	232	Petrominerals Corp.	10,624	202	7,550	293	(704)	206	7,193	246	1,028
248	213	Brock Exploration Corp.[35]	10,427	209	5,975	174	182	266	2,480	203	2,018
249	241	Sage Drilling Co. Inc.[40]	10,419	232	4,331	301	(856)	216	6,004	278	539
250	217	Nugget Oil Corp.[105]	10,281	256	2,982	323	(1,522)	360	(1,557)	268	670
251	237	Seahawk Oil International Inc.	10,198	254	3,017	289	(617)	224	5,086	224	1,534
252	334	Wichita River Oil Co.[108]	10,083	257	2,885	139	917	230	4,788	164	5,282
253	249	Thor Energy Resources Inc.[13]	10,001	196	7,830	196	2	215	6,288	251	847
254	283	Falcon Oil & Gas Co. Inc.[13]	9,901	289	1,520	156	441	220	5,364	178	4,067
255	254	Permian Basin Royalty Trust	9,816	130	26,098	47	25,523	203	[61]7,340	—	0

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
214	0.094	274	0.273	234	0.561	295	2.249	211	0.094	273	0.273	232	0.561	293	2.249	—	NA
260	0.047	182	1.476	203	0.948	152	29.07	257	0.047	180	1.476	201	0.948	146	29.07	—	NA
169	0.176	96	8.181	226	0.642	182	17.28	173	0.159	134	3.386	224	0.642	179	17.28	205	0.500
224	0.086	200	1.188	194	1.093	145	34.31	222	0.086	196	1.188	192	1.093	140	34.31	250	0.130
242	0.067	248	0.472	230	0.597	228	7.229	240	0.067	245	0.472	228	0.597	225	7.229	82	14.00
191	0.128	139	3.207	278	[75]0.323	187	[75]16.50	188	0.128	138	3.207	274	[75]0.323	184	[75]16.50	—	NA
261	0.047	202	1.148	309	0.202	236	5.902	258	0.047	197	1.148	305	0.202	234	5.902	—	—
253	0.056	227	0.732	275	0.326	212	10.54	250	0.056	223	0.732	271	0.326	209	10.54	113	5.560
195	0.123	146	3.005	222	0.684	177	20.08	193	0.123	144	3.005	220	0.684	174	20.08	95	8.680
128	0.388	179	1.530	131	3.317	205	12.36	120	0.388	177	1.530	122	3.317	202	12.36	134	3.590
158	0.206	188	1.332	167	1.754	173	21.28	155	0.206	185	1.332	163	1.754	170	21.28	168	1.680
280	0.037	206	1.124	221	0.728	165	23.82	275	0.037	201	1.124	219	0.728	161	23.82	—	NA
187	0.134	174	1.618	205	0.935	142	37.23	189	0.128	239	0.535	215	0.771	297	2.102	199	0.600
278	0.038	267	0.300	334	0.141	312	1.568	273	0.038	265	0.300	329	0.141	310	1.568	162	1.810
165	0.191	222	0.818	154	2.254	219	9.288	162	0.191	217	0.818	150	2.254	216	9.280	227	0.300
281	0.035	204	1.147	251	0.456	215	9.688	277	0.035	199	1.147	248	0.456	212	9.688	220	0.374
228	0.082	228	0.719	179	1.471	207	12.01	226	0.082	224	0.719	175	1.471	204	12.01	108	6.390
222	0.087	184	1.400	253	0.449	188	16.47	220	0.087	182	1.400	250	0.449	185	16.47	—	NA
245	0.063	186	1.362	299	0.236	216	9.655	242	0.063	183	1.362	295	0.236	213	9.655	112	5.800
156	0.207	210	1.048	173	1.580	224	8.614	153	0.207	205	1.048	169	1.580	220	8.614	252	0.114
262	0.047	322	0.094	241	0.532	373	0.232	324	0.016	321	0.094	359	0.052	371	0.232	—	—
93	0.880	109	6.066	95	6.491	134	41.77	87	0.880	104	6.066	88	6.491	129	41.77	—	NA
328	0.015	256	0.400	212	0.883	143	36.99	325	0.015	254	0.400	208	0.883	137	36.99	206	0.500
250	0.057	366	0.031	290	0.273	367	0.326	247	0.057	365	0.031	286	0.273	365	0.326	—	—
159	0.205	189	1.324	259	0.407	325	1.271	156	0.205	186	1.324	255	0.407	322	1.271	228	0.300
246	0.062	232	0.659	297	0.239	278	2.815	243	0.062	228	0.659	293	0.239	276	2.815	—	—
215	0.092	268	0.299	206	0.923	264	3.684	213	0.092	266	0.299	203	0.923	262	3.684	118	5.000
275	0.039	250	0.434	315	0.170	259	4.311	271	0.039	248	0.434	311	0.170	257	4.311	44	35.00
217	0.090	221	0.820	265	0.354	220	9.250	215	0.090	216	0.820	261	0.354	217	9.250	—	—
291	0.030	230	0.665	316	0.169	239	5.427	287	0.030	227	0.665	312	0.169	237	5.427	—	—
196	0.123	218	0.881	196	1.060	201	12.86	194	0.123	213	0.881	194	1.060	198	12.86	—	NA
211	0.099	201	1.166	177	1.517	221	9.037	212	0.094	219	0.788	174	1.477	229	6.914	137	3.429
166	0.188	244	0.531	168	1.700	244	5.059	163	0.188	241	0.531	164	1.700	242	5.059	—	NA
189	0.133	181	1.496	231	0.589	214	9.873	186	0.133	179	1.496	229	0.589	211	9.873	246	0.180
208	0.101	197	1.205	209	0.890	191	14.92	347	0.009	226	0.672	353	0.058	224	7.334	223	0.320
163	0.195	213	0.978	199	1.000	227	7.426	159	0.195	208	0.978	197	1.000	223	7.426	151	2.460
194	0.125	245	0.497	190	1.193	240	5.208	192	0.125	242	0.497	187	1.193	238	5.208	—	NA
243	[107]0.067	205	[107]1.138	244	0.513	208	11.63	241	[107]0.067	200	[107]1.138	241	0.513	205	11.63	212	[107]0.420
207	0.104	246	0.492	197	1.014	248	4.795	205	0.104	243	0.492	195	1.014	246	4.795	165	1.780
172	0.171	224	0.764	182	1.440	256	4.395	168	0.171	220	0.764	178	1.440	254	4.395	—	NA
—	—	106	6.423	—	—	81	134.8	—	—	100	6.423	—	—	70	134.8	—	—
268	0.044	301	0.145	159	1.994	251	4.544	264	0.044	300	0.145	154	1.994	249	4.544	119	5.000
157	0.207	380	0.010	158	2.054	349	0.541	154	0.207	380	0.010	153	2.054	347	0.541	186	1.000
209	0.100	194	1.279	258	0.410	217	9.592	207	0.100	191	1.279	254	0.410	214	9.592	171	1.450
284	0.034	290	0.215	339	0.118	324	1.307	280	0.034	289	0.215	334	0.118	321	1.307	221	0.351
282	0.035	223	0.811	238	0.544	204	12.57	278	0.035	218	0.811	236	0.544	201	12.57	145	2.817
216	0.091	258	0.381	160	1.965	235	6.173	214	0.091	256	0.381	155	1.965	233	6.173	156	2.241
218	0.090	295	0.170	223	0.666	280	2.744	216	0.090	294	0.170	221	0.666	278	2.744	235	0.250
334	0.013	317	0.104	263	0.378	241	5.158	331	0.013	316	0.104	259	0.378	239	5.158	210	0.470
269	0.044	266	0.303	228	0.622	179	18.72	265	0.044	264	0.303	226	0.622	176	18.72	—	—
74	1.309	126	4.156	55	16.31	133	42.68	68	1.309	122	4.156	47	16.31	128	42.68	—	—

Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
256	227	Trinity Resources Ltd.[109]	9,703	226	4,843	233	(171)	248	3,564	239	1,111
257	242	Summit Energy Inc.[110]	9,673	252	3,124	302	(864)	235	4,459	245	1,029
258	233	Bellwether Exploration Co.[40]	9,637	286	[90]1,577	344	[90](3,238)	355	(450)	304	[90]267
259	250	Cobb Resources Corp.[40]	9,394	277	2,130	245	(245)	212	6,457	250	851
260	265	ZG Energy Corp.[111]	9,357	241	3,908	342	(3,154)	276	2,082	207	1,955
261	260	Com-Tek Resources Inc.[9]	9,335	299	1,282	292	(691)	247	3,738	167	5,172
262	256	Western Energy Development Co. Inc.[112,36]	9,092	294	[113]1,369	351	[113](4,744)	371	(9,813)	315	[113]178
263	—	Xplor Corp.[27]	8,988	253	3,077	204	(49)	199	7,931	343	77
264	281	Castle Energy Corp.[9]	8,940	225	4,870	104	2,502	245	3,890	230	1,356
265	248	Newhall Resources	8,590	219	[114]5,262	126	[114]1,315	204	[10]7,254	333	111
266	259	QED Exploration Inc.[110]	8,578	269	2,331	176	169	213	6,328	232	1,292
267	246	ConVest Energy Corp.	8,565	275	2,224	222	(129)	225	5,075	299	342
268	—	N.Y. Life Oil & Gas Prod. Prop. I-C Ltd.	8,294	263	2,638	237	(198)	201	[10]7,838	144	7,313
269	214	Ratex Resources Inc.[9]	8,180	274	2,227	367	(10,584)	377	(20,749)	329	125
270	—	N.Y. Life Oil & Gas Prod. Prop. II-A LP	8,137	341	660	168	237	202	[10]7,658	152	5,877
271	—	Graham Income Fund 82A L.P.	8,081	270	2,329	164	287	198	[10]8,062	—	NA
272	258	Home-Stake Oil & Gas Co.	7,916	231	4,387	130	1,132	209	6,932	234	1,245
273	278	Nahama & Weagant Energy Co.[13]	7,876	292	1,429	307	(990)	249	3,502	216	1,634
274	220	Lomak Petroleum Inc.	7,687	203	7,475	355	(6,026)	367	(5,925)	175	4,562
275	284	Credo Petroleum Corp.[103]	7,565	327	771	175	182	208	7,054	256	777
276	276	Alta Energy Corp.[40]	7,527	295	1,328	203	(46)	278	2,047	208	1,901
277	—	Search Natural Resources Inc.	7,365	399	34	282	(507)	314	1,042	165	5,182
278	252	Striker Petroleum Corp.	7,322	288	1,548	338	(2,407)	223	5,150	300	325
279	261	Pyramid Oil Co.	7,260	242	3,817	310	(1,034)	214	6,314	248	976
280	286	Whiting Petroleum Corp.	7,169	272	2,246	161	308	218	5,646	24[illegible]	1,106
281	264	Golden Oil Co.[40]	7,031	285	1,592	270	(389)	222	5,29[illegible]	3[illegible]9	164
282	271	GeoResources Inc.	6,898	261	2,764	181	105	241	3,980	303	274
283	268	Panhandle Royalty Co.[9]	6,865	259	2,790	152	508	234	4,555	258	765
284	280	Mustang Cos. Inc.	6,638	246	3,500	234	(179)	217	5,769	200	2,300
285	291	Gold King Consolidated Inc.[115]	6,574	291	1,453	257	(305)	228	5,004	219	1,582
286	—	Omni Exploration Inc.[9]	6,516	276	2,172	279	(483)	297	1,471	365	27
287	270	Houston Oil Royalty Trust	6,506	319	830	155	[73]470	211	[61]6,506	—	NA
288	267	Partners Oil Co.	6,431	284	1,594	299	(837)	256	3,217	254	799
289	295	Kelley Oil Corp.	6,333	236	4,103	251	(262)	274	2,118	222	1,557
290	309	Republic Resources Corp.	6,301	303	1,182	258	(310)	309	1,142	373	8
291	285	Prima Energy Corp.[40]	6,287	298	1,298	185	77	221	5,351	288	465
292	257	Basic Earth Science Systems Inc.	6,177	278	1,921	324	(1,534)	270	2,260	271	601
293	—	Eglington Oil & Gas Corp.[116]	6,122	314	915	188	64	370	(9,497)	243	1,078
294	—	Plexus Resources Corp.[40]	6,091	355	510	284	(532)	261	2,822	253	810
295	—	Pinnacle Petroleum Inc.	5,946	310	1,029	298	(786)	244	3,892	296	367
296	273	Petroleum Reserve Corp.[40]	5,888	265	2,522	250	(260)	345	191	356	42
297	296	Burton/Hawks Inc.	5,711	244	3,735	195	16	238	4,136	305	267
298	224	Magic Circle Energy Corp.	5,673	245	3,510	113	1,830	231	4,688	269	668
299	—	Energy Sources Inc.[103]	5,492	308	1,082	325	(1,663)	364	(3,944)	325	137
300	—	N.Y. Life Oil & Gas Prod. Prop. I-A Ltd.	5,396	280	1,894	230	(158)	227	[10]5,060	177	4,179
301	282	[illegible] Corp.	5,173	266	2,500	326	(1,712)	373	(11,460)	—	NA
302	311	[illegible] Oil & Gas Co. Inc.[40]	4,996	324	807	157	417	252	3,381	233	1,276
303	—	N.Y. Life Oil & Gas Prod. Prop. I-B Ltd.	4,992	348	569	184	99	229	[10]4,875	181	3,686
304	277	Altex Industries Inc.[9]	4,928	307	1,083	317	(1,343)	236	4,433	353	49
305	263	[illegible] Inc.[100]	4,836	264	2,532	306	(962)	285	1,844	307	255
306	—	Woodbine Petroleum Inc.[9]	4,686	315	914	273	(417)	290	1,686	279	529

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
177	0.159	208	1.101	232	0.585	250	4.549	174	0.159	203	1.101	230	0.585	248	4.549	169	1.660
219	0.090	212	1.009	191	1.161	225	7.591	217	0.090	207	1.009	188	1.161	221	7.591	266	0.020
285	[90]0.033	254	[90]0.407	269	0.343	226	7.511	281	[90]0.033	252	[90]0.407	265	0.343	222	7.511	247	[90]0.170
226	0.085	300	0.146	150	2.354	268	3.355	224	0.085	299	0.146	147	2.354	266	3.355	173	1.340
192	0.127	243	0.532	214	0.852	243	5.104	190	0.127	240	0.532	210	0.852	241	5.104	238	0.209
258	0.050	279	0.243	169	1.637	213	9.945	255	0.050	278	0.243	165	1.637	210	9.945	—	—
203	[113]0.111	328	[113]0.089	187	1.326	285	2.598	201	[113]0.111	327	[113]0.089	184	1.326	283	2.598	—	—
220	0.090	252	0.410	252	0.452	252	4.525	218	0.090	250	0.410	249	0.452	250	4.525	240	0.200
264	0.046	239	0.581	319	0.167	202	12.78	260	0.046	234	0.581	315	0.167	199	12.78	141	3.300
197	0.123	187	1.358	248	0.480	229	7.226	195	0.123	184	1.358	245	0.480	226	7.226	164	1.800
240	0.072	264	0.330	270	0.338	296	2.228	238	0.072	262	0.330	266	0.338	294	2.228	101	7.471
251	0.056	263	0.353	235	0.560	282	2.704	248	0.056	261	0.353	233	0.560	280	2.704	258	0.090
205	0.106	236	0.608	242	0.521	242	5.113	203	0.106	231	0.608	239	0.521	240	5.113	—	NA
304	0.024	209	1.054	281	0.319	249	4.656	300	0.024	204	1.054	277	0.319	247	4.656	—	—
310	0.021	312	0.113	237	0.546	260	4.180	306	0.021	311	0.113	235	0.546	258	4.180	—	NA
206	0.106	216	0.908	243	0.519	245	5.047	204	0.106	211	0.908	240	0.519	243	5.047	—	NA
171	0.172	219	0.872	208	0.902	233	6.733	167	0.172	214	0.872	205	0.902	231	6.733	152	2.350
308	0.023	257	0.386	261	0.384	274	3.082	304	0.023	255	0.386	257	0.384	272	3.082	—	NA
300	0.026	249	0.436	353	0.065	303	1.939	296	0.026	247	0.436	348	0.065	302	1.939	136	3.500
321	0.018	344	0.054	328	0.151	281	2.719	317	0.018	344	0.054	324	0.151	279	2.719	179	1.185
276	0.039	309	0.120	245	0.510	223	8.641	272	0.039	308	0.120	242	0.510	219	8.641	236	0.230
—	NA	—	NA	289	0.278	265	3.569	—	NA	—	NA	285	0.278	263	3.569	—	NA
233	0.080	348	0.048	152	2.308	374	0.227	231	0.080	348	0.048	149	2.308	372	0.227	158	2.070
186	0.139	365	0.034	201	0.968	362	0.408	184	0.139	364	0.034	199	0.968	359	0.408	143	3.000
265	0.046	270	0.293	267	0.349	287	2.571	261	0.046	268	0.293	263	0.349	285	2.571	—	—
247	0.062	283	0.239	186	1.348	310	1.629	244	0.062	282	0.239	183	1.348	308	1.629	—	—
227	0.083	379	0.011	211	0.888	375	0.207	225	0.083	379	0.011	207	0.888	374	0.207	—	—
270	0.044	207	1.118	312	[79]0.190	231	[79]7.048	266	0.044	202	1.118	308	[79]0.190	228	[79]7.048	196	0.664
213	0.096	272	0.275	216	0.803	290	2.509	210	0.096	271	0.275	213	0.803	289	2.509	140	3.320
271	0.043	325	0.091	233	0.585	339	0.824	267	0.043	324	0.091	231	0.585	337	0.824	187	1.000
234	0.080	235	0.618	218	0.758	254	4.483	232	0.080	230	0.618	216	0.758	252	4.483	—	—
311	0.021	285	0.234	317	0.169	263	3.801	307	0.021	284	0.234	313	0.169	261	3.801	—	—
343	0.011	334	0.082	368	0.033	358	0.436	339	0.011	333	0.082	365	0.033	355	0.436	218	0.378
356	0.008	237	0.585	359	0.054	222	8.862	353	0.008	232	0.585	355	0.054	218	8.862	128	4.220
372	0.003	375	0.018	384	0.011	383	0.127	369	0.003	375	0.018	383	0.011	382	0.127	—	—
351	0.009	318	0.104	371	0.031	314	1.558	348	0.009	317	0.104	368	0.031	312	1.558	202	0.560
198	0.122	292	0.193	239	0.537	262	3.926	196	0.122	291	0.193	237	0.537	260	3.926	176	1.240
273	0.040	363	0.035	227	0.630	361	0.413	269	0.040	362	0.035	225	0.630	358	0.413	—	NA
348	0.010	326	0.091	347	0.081	277	2.839	344	0.010	325	0.091	342	0.081	275	2.839	231	0.270
294	0.028	305	0.128	325	0.156	329	1.150	290	0.028	304	0.128	321	0.156	327	1.160	195	0.720
200	0.117	214	0.967	207	0.912	253	4.497	198	0.117	209	0.967	204	0.912	251	4.497	188	1.000
255	0.053	336	0.074	219	0.754	292	2.481	252	0.053	335	0.074	217	0.754	291	2.481	244	0.187
379	0.001	323	0.094	389	0.005	342	0.729	379	0.001	322	0.094	389	0.005	339	0.729	—	—
272	0.042	286	0.226	249	0.474	305	1.816	268	0.042	285	0.226	246	0.474	304	1.816	—	—
236	0.079	251	0.414	255	0.441	273	3.193	234	0.079	249	0.414	251	0.441	271	3.193	—	NA
293	0.029	255	0.406	326	0.153	279	2.805	289	0.029	253	0.406	322	0.153	277	2.805	—	—
335	0.013	313	0.113	293	0.263	315	1.530	332	0.013	312	0.113	289	0.263	313	1.530	189	1.000
309	0.022	316	0.106	268	0.347	275	3.078	305	0.022	315	0.106	264	0.347	273	3.078	—	NA
295	0.028	354	0.044	304	0.216	379	0.172	291	0.028	353	0.044	300	0.216	378	0.172	—	—
229	0.082	280	0.240	156	2.114	267	3.359	227	0.082	279	0.240	152	2.114	265	3.359	241	0.200
312	0.021	273	0.275	302	0.220	266	3.543	308	0.021	272	0.275	298	0.220	264	3.543	217	0.380

Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
307	298	Dallas Oil & Minerals Inc.	4,681	297	1,308	238	(207)	233	4,595	231	1,297
308	301	Greenwood Holdings Inc.	4,571	249	[117]3,300	102	[117]2,593	254	3,346	264	[117]713
309	290	Great Eastern Energy & Development Corp.	4,406	283	1,655	243	(235)	240	4,050	240	1,111
310	—	Comstock Resources Inc.	4,381	364	379	277	(462)	283	1,917	198	2,507
311	294	Monogram Oil & Gas Inc.[103]	4,344	300	1,254	219	(124)	366	(5,003)	367	22
312	297	Wexco of Delaware Inc.[118]	4,325	302	1,196	283	(513)	253	3,379	252	825
313	300	Parallel Petroleum Corp.	4,286	329	764	252	(268)	258	3,097	255	784
314	289	Wepco Energy Co.	4,069	311	986	311	(1,066)	272	2,147	311	234
315	304	Energy Capital Development Corp.	3,890	352	529	303	(889)	311	1,101	331	120
316	299	K.R.M. Petroleum Corp.	3,742	279	1,909	315	(1,173)	262	2,727	242	1,084
317	321	Ranger Oil Ltd.[51]	3,656	325	806	167	[44]256	—	NA	—	NA
318	—	Senergy 1986 Ltd.	3,593	333	720	354	(5,887)	250	[10]3,495	154	5,781
319	302	Kimco Energy Corp.[119,40]	3,590	290	1,515	319	(1,454)	295	1,480	238	1,112
320	312	Southern Mineral Corp.	3,547	267	2,389	159	361	259	2,995	218	1,595
321	313	Tyrex Oil Co.[40]	3,488	306	1,122	226	(145)	255	3,277	229	1,385
322	—	Energetics Inc.	3,470	353	529	274	(419)	281	1,997	266	691
323	308	Arch Petroleum Inc.[120,103]	3,372	312	[121]975	162	[121]303	291	1,626	342	[121]78
324	—	N.Y. Life Oil & Gas Prod. Prog. I-B Ltd.	3,344	301	1,227	223	(129)	257	[10]3,103	188	3,256
325	—	International Basic Resources Inc.[40]	3,287	394	80	268	(355)	313	1,057	314	194
326	—	Wright Brothers Energy Inc.[105]	3,223	282	1,699	278	(468)	299	1,431	316	171
327	327	Appalachian Oil & Gas Co. Inc.[40]	3,180	271	2,267	158	417	320	805	272	596
328	293	V[illegible]ex Petroleum Inc.	3,114	304	1,158	341	(3,142)	331	644	257	775
329	336	Questa Oil & Gas Co.	3,068	313	970	216	(108)	292	1,550	267	672
330	322	Chaparral Resources Inc.[65]	3,055	323	814	271	(391)	275	2,104	286	485
331	345	Impact Energy Inc.	2,974	381	211	269	(374)	306	1,212	298	346
332	305	NP Energy Corp.[35]	2,886	387	173	224	(137)	308	1,162	366	25
333	316	Aspen Exploration Corp.[40]	2,858	356	468	246	(247)	263	2,709	345	71
334	315	Crescent Oil & Gas Corp.[9]	2,631	362	420	297	(767)	271	2,223	338	85
335	360	HarCor Energy Inc.[122]	2,574	296	1,317	198	1	269	2,293	292	416
336	340	Western Energy Resources Inc.	2,552	373	269	285	(532)	265	2,494	237	1,124
337	324	Pantepec International Inc.	2,543	386	183	247	(249)	267	2,457	—	0
338	—	Argosy Energy Inc.	2,535	346	603	262	(325)	277	2,074	287	466
339	333	Keldon Oil Co.[110]	2,529	331	736	202	(34)	326	708	376	7
340	323	Penn-Pacific Corp.[9]	2,527	367	336	165	259	268	2,391	—	0
341	329	Double Eagle Petroleum & Mining Co.[27]	2,321	320	827	221	(128)	273	2,136	281	521
342	328	Intramerican Oil & Minerals Inc.	2,269	332	722	256	(303)	286	1,837	332	114
343	—	Broken Arrow Petroleum Co.[19]	2,259	351	545	182	102	287	1,828	306	260
344	346	Taurus Petroleum Inc.[9]	2,167	316	905	264	(335)	316	1,000	276	575
345	318	Plano Petroleum Corp.[9]	2,150	357	465	287	(604)	279	2,007	285	506
346	310	Roseland Oil & Gas Inc.[9]	2,135	360	[123]429	201	[123](25)	307	1,173	337	[123]98
347	332	Nova Natural Resources Corp.[9]	2,122	338	669	239	(207)	280	2,004	341	79
348	319	Roberts Oil & Gas Inc.[19]	2,062	354	516	313	(1,112)	347	110	291	434
349	242	Summit Petroleum Corp.[110]	2,042	396	62	261	(323)	346	162	372	10
350	341	Petrol Industries Inc.	2,027	287	1,567	166	259	284	1,902	371	16
351	337	Albion International Resources Inc.	2,003	369	327	186	75	282	1,948	362	31
352	351	Pioneer Oil & Gas Corp.[9]	1,946	321	822	178	160	298	1,459	294	389
353	—	Hailey Energy Corp.	1,933	368	335	335	(2,235)	305	1,243	320	164
354	325	Energy Resources of North Dakota Inc.[36]	1,917	334	704	235	(185)	289	1,712	308	250
355	307	Twin Richfield Oils Inc.[51]	1,888	379	220	275	(455)	350	(10)	—	0
356	—	Struthers Oil & Gas Corp.	1,852	335	701	96	2,981	349	37	339	84
357	342	General Energy Resources & Technology Corp.[124]	1,846	317	895	211	(70)	321	797	317	169

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
289	0.031	265	0.321	305	0.214	300	1.968	285	0.031	263	0.321	301	0.214	299	1.968	263	0.059
263	[117]0.047	302	[117]0.136	294	0.256	289	2.522	259	[117]0.047	301	[117]0.136	290	0.256	288	2.522	57	[117]23.00
257	0.051	327	0.091	285	[75]0.292	317	[75]1.513	254	0.051	326	0.091	281	[75]0.292	315	[75]1.513	139	3.400
380	0.001	—	—	250	0.457	372	0.250	380	0.001	—	—	247	0.457	370	0.250	—	NA
329	0.015	253	0.410	360	0.054	284	2.684	326	0.015	251	0.410	356	0.054	282	2.684	—	—
286	0.032	275	0.261	332	0.146	326	1.216	282	0.032	274	0.261	328	0.146	324	1.216	181	1.170
320	0.019	288	0.219	276	0.325	298	2.183	316	0.019	287	0.219	272	0.325	296	2.183	177	1.200
296	0.027	294	0.185	286	0.283	302	1.942	292	0.027	293	0.185	282	0.283	301	1.942	267	0.020
367	0.004	335	0.082	273	0.331	218	9.487	364	0.004	334	0.082	269	0.331	215	9.487	—	—
237	0.079	262	0.369	280	0.320	237	5.532	235	0.079	260	0.369	276	0.320	235	5.532	182	1.170
287	0.032	296	0.169	322	0.163	359	0.433	283	0.032	295	0.169	318	0.163	356	0.433	242	0.200
305	0.024	299	0.152	320	0.167	321	1.344	301	0.024	298	0.152	316	0.167	318	1.344	—	NA
235	0.080	355	0.044	274	0.329	380	0.157	233	0.080	354	0.044	270	0.329	379	0.157	192	0.810
297	0.027	217	0.885	346	[75]0.085	238	[75]5.482	293	0.027	212	0.885	341	[75]0.085	236	[75]5.482	149	2.608
283	0.035	362	0.039	296	0.248	357	0.445	279	0.035	361	0.039	292	0.248	354	0.445	—	—
362	0.005	345	0.053	340	0.114	323	1.314	359	0.005	345	0.053	335	0.114	320	1.314	—	NA
301	[121]0.026	304	[121]0.129	217	0.779	313	1.566	297	[121]0.026	303	[121]0.129	214	0.779	311	1.566	257	[121]0.100
259	0.049	271	0.284	303	0.220	297	2.218	256	0.049	270	0.284	299	0.220	295	2.218	—	NA
—	—	360	0.040	—	—	309	1.650	—	—	359	0.040	—	—	307	1.650	—	NA
324	0.017	241	0.545	323	0.159	200	13.36	320	0.017	235	0.545	319	0.159	197	13.36	207	0.500
387	(s)	203	1.148	392	0.001	232	6.840	387	(s)	198	1.148	392	0.001	230	6.840	144	2.835
256	0.053	297	0.168	204	0.942	291	2.494	253	0.053	296	0.168	202	0.942	290	2.494	—	—
344	0.011	281	0.240	356	[75]0.061	272	[75]3.267	340	0.011	280	0.240	351	[75]0.061	270	[75]3.267	170	1.619
352	0.009	303	0.132	327	0.152	270	3.272	349	0.009	302	0.132	323	0.152	268	3.272	—	—
336	0.013	—	—	344	0.098	—	—	333	0.013	—	—	339	0.098	—	—	—	—
385	0.001	307	0.124	338	0.122	258	4.363	385	0.001	306	0.124	333	0.122	256	4.363	—	—
313	0.021	376	0.018	292	0.268	348	0.619	309	0.021	376	0.018	288	0.268	346	0.619	262	0.065
368	0.004	298	0.156	374	0.028	261	4.172	365	0.004	297	0.156	371	0.028	259	4.172	193	0.810
292	0.030	259	0.378	277	0.324	299	2.042	288	0.030	257	0.378	273	0.324	298	2.042	—	—
353	0.009	333	0.084	306	0.206	308	1.741	350	0.009	332	0.084	302	0.206	306	1.741	—	—
381	0.001	329	0.088	385	0.011	306	1.787	381	0.001	328	0.088	384	0.011	323	1.271	191	0.830
244	0.066	—	—	254	0.447	390	0.060	371	0.002	—	—	385	0.010	390	0.060	—	—
314	0.021	321	0.096	264	0.365	330	1.060	310	0.021	320	0.096	260	0.365	328	1.060	—	—
360	0.007	314	0.111	345	0.096	318	1.487	357	0.007	313	0.111	340	0.096	316	1.487	—	—
288	0.032	368	0.028	301	0.221	331	1.058	284	0.032	367	0.028	297	0.221	329	1.058	200	0.570
330	0.014	282	0.240	314	0.179	276	3.035	327	0.014	281	0.240	310	0.179	274	3.035	254	0.108
—	—	384	0.006	—	—	328	1.167	—	—	384	0.006	—	—	326	1.167	—	—
315	0.021	289	0.217	329	0.150	319	1.431	311	0.021	288	0.217	325	0.150	317	1.431	—	—
331	0.014	347	0.052	352	0.070	336	0.911	328	0.014	347	0.052	347	0.070	334	0.911	123	4.670
339	[123]0.012	353	[123]0.045	337	0.130	368	0.314	335	[123]0.012	352	[123]0.045	332	0.130	366	0.314	—	NA
325	0.017	352	0.046	321	0.165	351	0.526	321	0.017	351	0.046	317	0.165	349	0.526	249	0.140
349	0.010	284	0.239	370	0.032	316	1.523	345	0.010	283	0.239	367	0.032	314	1.523	269	0.012
374	0.002	374	0.019	349	0.079	334	0.975	372	0.002	374	0.019	344	0.079	332	0.975	—	NA
232	0.081	372	0.024	100	6.241	363	0.407	230	0.081	372	0.024	91	6.241	360	0.407	—	—
340	0.012	358	0.041	284	0.297	332	1.017	336	0.012	357	0.041	280	0.297	330	1.017	—	
179	0.151	308	0.124	295	0.252	293	2.377	176	0.151	307	0.124	291	0.252	292	2.377	—	NA
388	(s)	367	0.031	377	0.024	335	0.922	388	(s)	366	0.031	375	0.024	333	0.922	—	NA
303	0.025	388	0.003	324	0.158	394	0.009	299	0.025	388	0.003	320	0.158	394	0.009	233	0.260
—	—	311	0.114	—	—	311	1.613	—	—	310	0.114	—	—	309	1.613	—	—
363	0.005	269	0.296	390	0.004	364	0.384	360	0.005	267	0.296	390	0.004	361	0.384	272	0.001
298	0.027	310	0.119	342	0.107	322	1.320	204	0.027	309	0.119	337	0.107	319	1.320	270	0.010

Rank by total assets			Total assets	Total revenue		Net income		Stockholders' equity		Capital & Expl. spending	
1987	1986	Company	$000	Rank	$000	Rank	$000	Rank	$000	Rank	$000
358	314	**Columbine Exploration Corp.**	1,837	293	[125]1,415	322	[125](1,483)	362	(2,683)	349	[125]63
359	339	**Castle Royalty L.P.**	1,812	374	248	213	(96)	288	[10]1,787	—	0
360	317	**Lyric Energy Inc.**[105]	1,786	365	370	337	(2,317)	358	(746)	350	55
361	—	**Calcasieu Real Estate & Oil Co. Inc.**	1,739	340	664	163	298	294	1,499	361	32
362	306	**Oxford Consolidated Inc.**[35]	1,724	305	1,142	312	(1,090)	335	522	274	583
363	343	**Willard Pease Oil & Gas Co.**	1,705	345	604	236	(193)	338	451	335	100
364	320	**Exploration Co.**[27]	1,685	385	194	330	(1,971)	334	552	265	692
365	347	**Big Piney Oil & Gas Co.**	1,621	382	199	207	(54)	293	1,504	374	8
366	—	**Morrison Nuclear Inc.**[126]	1,598	328	770	199	0	363	(3,432)	369	19
367	—	**Cap Ltd.**	1,581	326	778	170	212	301	[10]1,370	324	139
368	—	**Gladstone Resources Inc.**	1,555	395	73	210	(61)	303	1,330	—	0
369	—	**International Management & Research Corp.**	1,513	388	159	288	(605)	323	784	347	66
370	355	**Hubco Exploration Inc.**	1,483	347	602	215	(104)	353	(312)	284	510
371	358	**Sheffield Exploration Co. Inc.**[40]	1,433	318	892	225	(143)	310	1,111	273	587
372	366	**Golden Triangle Royalty & Oil Inc.**	1,410	391	111	263	(330)	302	1,362	330	125
373	364	**Cheyenne Resources Inc.**	1,324	378	227	254	(297)	325	727	310	237
374	348	**Reserve Exploration Co.**[35]	1,252	358	455	229	(155)	341	378	354	46
375	361	**Sharon Energy Ltd.**[30]	1,237	337	685	190	35	352	(230)	283	511
376	—	**DOL Resources Inc.**	1,223	390	132	217	(114)	333	634	—	0
377	359	**EMC Energies Inc.**[40]	1,206	366	348	227	(152)	336	512	348	65
378	352	**Toklan Oil Corp.**[27]	1,193	330	761	240	(212)	328	690	323	146
379	349	**Love Oil Co. Inc.**[19]	1,173	380	212	280	(499)	315	1,011	275	580
380	—	**Bogert 1985-III L.P.**	1,168	344	616	253	(292)	317	[10]988	—	0
381	369	**TPEX Exploration Inc.**[40]	1,094	361	423	232	(167)	329	686	318	167
382	356	**Wicklund Holding Co.**[127]	1,089	372	286	255	(297)	319	825	377	5
383	—	**RED Production I-A L.P.**	1,083	398	53	197	2	312	[10]1,075	247	1,013
384	350	**International Royalty & Oil Co.**[9]	1,050	389	135	304	(950)	359	(844)	351	51
385	368	**Belyard Oil & Gas Ltd.**[105]	1,019	375	242	212	(85)	339	435	364	28
386	387	**Texas Vanguard Oil Co.**	1,018	349	567	179	131	330	675	313	198
387	363	**Carmel Energy Inc.**	1,014	342	656	200	(10)	344	205	—	0
388	354	**Eagle Exploration Co.**[35]	1,008	350	552	309	(1,000)	368	(6,241)	326	137
389	—	**Loch Exploration Inc.**	1,002	397	58	281	(505)	357	(720)	—	NA
390	—	**National Petroleum Corp. Ltd.**[65,66]	1,000	370	311	260	(319)	348	47	370	18
391	—	**Minex Resources Inc.**[65]	967	392	108	194	28	318	894	363	31
392	—	**Texoil Inc.**	960	377	228	259	(316)	342	344	346	69
393	365	**Bengal Oil & Gas Corp.**	936	383	197	272	(393)	354	(367)	336	100
394	370	**Tri-Valley Corp.**[110]	833	343	617	248	(251)	343	296	309	238
395	—	**Winco Petroleum Corp.**[9]	801	393	98	208	(59)	322	787	358	34
396	382	**Amacan Resources Corp.**[105]	780	371	303	189	57	324	769	368	21
397	374	**Oil City Petroleum Inc.**[27]	765	376	242	265	(348)	340	391	357	40
398	381	**Yellowstone Resources Inc.**	727	384	197	209	(60)	327	693	328	136
399	375	**Hipoint Investments Ltd.**	724	359	442	276	(457)	376	(20,069)	340	81
400	—	**Rotan Mosle Energy Fund III Ltd.**	646	339	666	192	34	332	[10]636	359	34
		Totals	501,191,474		445,743,989		9,371,547		172,805,668		41,630,248

NA = Not Available. (s) indicates less than 500 bbl or 500 mcf. Fiscal yearend is Dec. 31 unless otherwise noted. 1. At fiscal yearend, was operating under Chapter 11. Emerged from Chapter 11 on 4-7-88. 2. Formerly Standard Oil. Subsidiary of British Petroleum Co. plc. 3. Includes 2 operating entities -- Marathon Oil and Texas Oil & Gas. 4. Operating income before foreign income taxes. 5. Subsidiary of E.I. du Pont de Nemours & Co. 6. After tax operating income. 7. Includes production and reserves attributed to both natural gas systems and exploration and production operations. 8. Wells attributable to exploration and production operations only. 9. Fiscal yearend Sep. 30. 10. Partners' capital. 11. May include insignificant amounts outside U.S. 12. Subsidiary of Burlington Northern Inc. 13. Fiscal yearend Jan. 31, 1988. 14. Formerly Diamond Shamrock. Refining operations were spun-off to form Diamond Shamrock R & M Inc. 15. Subsidiary of Union Pacific Corp. Since fiscal yearend has purchased Beard Corp. 16. Includes both cost of service and non-cost of service activities. 17. Unocal owns 86.04% of outstanding partnership units. 18. Subsidiary of Broken Hill Proprietary Co. Ltd. 19. Fiscal yearend May 31. 20. Enserch owns 87% of outstanding partnership units. 21. Transco owns 73% of outstanding partnership units. 22. Freeport-McMoRan owns 59% of outstanding partnership units. 23. Subsidiary of Santa Fe Southern Pacific. 24. Includes small amounts attributable to coal and lumber operations. 25. Operating income. 26. Murphy Oil owns 61% of outstanding stock. 27. Fiscal yearend Aug. 31. 28. Subsidiary of W.R. Grace & Co. 29. Identifiable assets. 30. Subsidiary of Newmont Mining. 31. Since fiscal yearend, company has announced plans to sell all oil and gas reserves. 32. Partners' capital less demand notes receivable. 33. Apache owns approximately 6.1% of outstanding partnership units. 34. Formerly Pacific Lighting Oil & Gas. Subsidiary of Pacific Enterprises. Since fiscal yearend has purchased Sabine. 35. Fiscal yearend Mar. 31. 36. Santa Fe Energy owns 82% of outstanding partnership units. 37. Subsidiary of CSX Corp. Since fiscal yearend all oil and gas operations have been sold to Total Minatome. 38. Maxus owns 81% of outstanding partnership units. 39. Company is an asset based holding company which is 82% owned by Cortez International. 40. Fiscal yearend June 30. 41. Capital and members' equity. 42. Subsidiary of Total Compagnie Francaise des Petroles. Since the fiscal yearend has been purchased by Pacific Enterprises. 46. Subsidiary of Southdown Inc. 47. Subsidiary of Houston Industries Inc. 48. Operating income before corporate overhead and interest. 49. Damson Oil owns 16.39% of outstanding partnership units. 50. Subsidiary of CMS Energy Corp. 51. U.S. operations only. 52. Subsidiary of Placer Dome Inc. 53. Subsidiary of Hiram Walker Resources Ltd. 54. Net operating income. 55. Subsidiary of PG Group Inc. 56. At fiscal yearend was subsidiary of Moore McCormack Resources. Since then has been purchased by Canadian Occidental Petroleum Ltd. 57. Kaneb Services owns 81.3% of outstanding partnership units. 58. Six months ended Dec. 31. 59. Subsidiary of Pacific Gas & Electric Co.

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mil bbl	Rank	Bcf	Rank	Mil bbl	Rank	Bcf	Rank	Mil bbl	Rank	Bcf	Rank	Mil bbl	Rank	Bcf	Rank	Wells
290	[125]0.031	338	[125]0.068	298	0.238	344	0.698	286	[125]0.031	337	[125]0.068	294	0.238	342	0.698	—	—
361	0.006	350	0.047	367	0.035	360	0.431	358	0.006	349	0.047	364	0.035	357	0.431	—	—
364	0.005	339	0.064	330	0.147	269	3.318	361	0.005	339	0.064	326	0.147	267	3.318	219	0.376
369	0.004	369	0.028	388	0.007	382	0.141	366	0.004	368	0.028	388	0.007	381	0.141	248	0.150
266	0.045	293	0.193	310	0.195	392	0.033	262	0.045	292	0.193	306	0.195	392	0.033	215	0.398
306	0.024	320	0.100	291	0.269	301	1.957	302	0.024	319	0.100	287	0.269	300	1.957	—	—
357	0.008	351	0.047	380	0.022	376	0.206	354	0.008	350	0.047	378	0.022	375	0.206	—	—
—	—	324	0.093	—	—	307	[75]1.748	—	—	323	0.093	—	—	305	[75]1.748	—	NA
267	0.045	386	0.004	335	0.140	—	—	263	0.045	386	0.004	330	0.140	—	—	—	—
316	0.021	278	0.246	350	0.075	333	1.004	312	0.021	277	0.246	345	0.075	331	1.004	—	—
373	0.003	382	0.009	362	[75]0.053	283	[75]2.694	370	0.003	382	0.009	358	[75]0.053	281	[75]2.694	—	—
—	—	364	0.035	—	—	352	0.488	—	—	363	0.035	—	—	350	0.488	—	NA
322	0.018	332	0.085	313	0.184	345	0.676	318	0.018	331	0.085	309	0.184	343	0.676	222	0.323
302	0.026	319	0.103	308	0.203	343	0.710	298	0.026	318	0.103	304	0.203	340	0.710	—	—
383	0.001	385	0.006	386	0.008	388	0.065	383	0.001	385	0.006	386	0.008	388	0.065	—	—
354	0.009	370	0.025	343	0.104	365	0.341	351	0.009	370	0.025	338	0.104	362	0.341	194	0.750
299	0.027	373	0.022	311	0.194	384	0.121	295	0.027	373	0.022	307	0.194	383	0.121	208	0.500
326	0.017	342	0.059	341	0.113	355	0.468	322	0.017	342	0.059	336	0.113	352	0.468	175	1.250
370	0.004	371	0.025	364	0.041	378	0.199	367	0.004	371	0.025	361	0.041	377	0.199	—	—
341	0.012	356	0.043	336	0.137	353	0.476	337	0.012	355	0.043	331	0.137	351	0.476	—	—
345	0.011	277	0.248	331	0.147	338	0.899	341	0.011	276	0.248	327	0.147	336	0.899	237	0.224
358	0.008	390	0.001	372	0.030	393	0.011	355	0.008	390	0.001	369	0.030	393	0.011	201	0.570
332	0.014	276	0.258	354	0.064	320	1.349	329	0.014	275	0.258	349	0.064	386	0.085	—	—
323	0.018	330	0.087	361	0.054	356	0.452	319	0.018	329	0.087	357	0.054	353	0.452	—	—
375	0.002	331	0.086	379	0.023	347	0.627	373	0.002	330	0.086	377	0.023	345	0.627	260	0.079
376	0.002	383	0.008	375	0.028	341	0.798	374	0.002	383	0.008	372	0.028	338	0.798	—	—
382	0.001	377	0.015	387	[75]0.008	377	[75]0.200	382	0.001	377	0.015	387	[75]0.008	376	[75]0.200	—	—
377	0.002	341	0.061	383	0.013	304	1.834	375	0.002	341	0.061	382	0.013	303	1.834	—	—
333	0.014	357	0.043	287	0.282	327	1.188	330	0.014	356	0.043	283	0.282	325	1.188	69	18.45
277	0.039	—	—	266	0.350	—	NA	276	0.036	—	—	262	0.350	—	—	—	—
307	0.024	337	0.074	369	0.033	381	0.153	303	0.024	336	0.074	366	0.033	380	0.153	178	1.188
366	0.004	378	0.013	363	0.052	371	0.269	363	0.004	378	0.013	360	0.052	369	0.269	—	—
338	0.012	349	0.048	333	0.144	354	0.469	376	0.002	369	0.026	373	0.028	364	0.336	—	—
378	0.002	391	0.001	348	0.080	386	0.090	377	0.002	391	0.001	343	0.080	385	0.090	—	NA
365	0.005	340	0.064	376	0.027	369	0.313	362	0.005	340	0.064	374	0.027	367	0.313	159	2.000
[illegible]	(a)	306	0.128	391	0.003	346	0.667	386	(a)	305	0.128	391	0.003	344	0.667	—	—
389	(a)	343	0.059	—	—	385	0.111	389	(a)	343	0.059	—	—	384	0.111	160	2.000
371	0.004	389	0.001	378	0.023	391	0.052	368	0.004	389	0.001	376	0.023	391	0.052	—	—
350	0.010	361	0.040	358	0.057	370	0.302	346	0.010	360	0.040	354	0.057	368	0.302	253	0.110
346	0.011	387	0.004	351	0.071	387	0.081	342	0.011	387	0.004	346	0.071	387	0.081	—	—
359	0.008	381	0.010	366	0.038	389	0.065	356	0.008	381	0.010	363	0.038	389	0.065	203	0.544
337	0.013	346	0.053	365	0.041	366	0.337	334	0.013	346	0.053	362	0.041	363	0.337	251	0.130
347	0.011	287	0.221	381	[75]0.020	350	[75]0.534	343	0.011	286	0.221	379	[75]0.020	348	[75]0.534	—	NA
	3,745.5		13,449.6		36,237.4		168,880.9		2,343.5		10,226.8		23,182.6		115,239.8		9,843.4

60. Subsidiary of Pacificorp. 61. Trust corpus. 62. Net productive wells only. 63. Since fiscal yearend has purchased all oil and gas operations of Kirby Exploration. 64. Subsidiary of CBI Industries Inc. 65. Fiscal yearend Nov. 30. 66. Financial data converted from Canadian dollars using exchange rates in effect at fiscal yearend. 67. Since fiscal yearend has sold oil and gas operations to American Exploration Co. 68. Includes acquisition of Houston Oil Fields Corp. 69. Damson Oil owns 10.52% of outstanding partnership units. 70. Since fiscal yearend has merged with Union Pacific Resources. 71. Damson Oil owns 6.36% of outstanding partnership units. 72. Apache owns 3.5% of outstanding partnership units. 73. Distributable cash. 74. Year ended Oct. 31. 75. Proved developed only. 76. Subsidiary of Washington Energy. 77. Revenue from unaffiliated customers only. 78. Since fiscal yearend has merged with Snyder Oil Partners. 79. Formerly Leader Development Corp. 80. Subsidiary of Brooklyn Union Gas. 81. Formerly American Quasar Petroleum. 82. Subsidiary of Gulf Resources & Chemical Corp. 83. Kelley Oil owns approximately 3.61% of outstanding partnership units. 84. Formerly Entex Energy Development Ltd. 85. Subsidiary of Northwest Natural Gas Co. 86. Subsidiary of Public Service Co. of Colorado. 87. Callon Petroleum owns 9% of outstanding partnership units. 88. Oil and gas operations only. Subsidiary of Penn Virginia Corp. 89. Operating profit before taxes, interest, depreciation and depletion. 90. Six months ended June 30. 91. U.S. subsidiary of Coho Resources Ltd. 92. Subsidiary of MDU Resources Group. 93. Subsidiary of Deminex Deutsche Erdoelversorgungs GmbH. 94. Saxon Oil owns 67% of outstanding partnership units. 95. Consolidated Oil & Gas owns 61% of outstanding partnership units. 96. ConVest owns 21.5% of outstanding partnership units. 97. Year ended Sep. 1. 98. U.S. operations of Inter-City Gas Corp. — Resources Div. 99. Formerly Zim Energy Corp. 100. Subsidiary of Energen Corp. 101. Subsidiary of Bridge Oil Ltd. 102. Fiscal yearend Feb. 29, 1988. 103. Fiscal yearend Oct. 31. 104. Subsidiary of Canada Northwest Energy Ltd. 105. Fiscal yearend Apr. 30. 106. Subsidiary of Sparton Corp. 107. Eight months ended Aug. 31. 108. Formerly Wichita Industries. 109. Canadian company which operates exclusively in U.S. 110. Fiscal yearend July 31. 111. Formerly Burkhart Petroleum Corp. 112. Since fiscal yearend has merged with Oxford Consolidated. 113. Fifteen months ended Mar. 31. 114. Historical cost basis. 115. Formerly Gerber Energy International. 116. Data includes Osceola Oil & Gas Corp. Both are subsidiaries of Eglington Exploration plc. 117. Fifteen months ended Mar. 31. 118. Subsidiary of WICOR Inc. 119. Formerly Henry Energy Corp. 120. Since fiscal yearend has merged with Usenco. 121. Ten months ended Oct. 31. 122. Formerly Pangea Petroleum Corp. 123. Eight months ended Sep. 30. 124. Formerly Reef Energy Corp. 125. Thirteen months ended Dec. 31. 126. U.S. operating subsidiary of Morrison Petroleums Ltd. 127. Formerly Wicklund Petroleum Corp.

The OGJ400 Company Index

Rank by total assets	Company name	Headquarters city
230	**Adams Resources & Energy Inc.**	Houston
73	**Adobe Resources Corp.**	New York
165	**Alamco Inc.**	Clarksburg, WV
351	**Albion International Resources Inc.**	Laguna Beach, CA
191	**Alexander Energy Corp.**	Oklahoma City
98	**Allegheny & Western Energy Corp.**	Charleston, WV
276	**Alta Energy Corp.**	Midland
304	**Altex Industries Inc.**	Denver
396	**Amacan Resources Corp.**	Salt Lake City
207	**Amax Oil & Gas Inc.**	Houston
19	**Amerada Hess Corp.**	New York
127	**American Exploration Co.**	Houston
215	**American National Petroleum Co.**	Houston
37	**American Petrofina Inc.**	Dallas
6	**Amoco Corp.**	Chicago
43	**Anadarko Petroleum Corp.**	Houston
69	**Apache Corp.**	Denver
147	**Apache Offshore Investment Partnership**	Denver
72	**Apache Petroleum Co. L.P.**	Denver
327	**Appalachian Oil & Gas Co. Inc.**	Chattanooga, TN
323	**Arch Petroleum Inc.**	Fort Worth
8	**ARCO (Atlantic Richfield Corp.)**	Los Angeles
338	**Argosy Energy Inc.**	Salt Lake City
29	**Arkla Inc.**	Shreveport
21	**Ashland Oil Inc.**	Ashland, KY
333	**Aspen Exploration Corp.**	Denver
111	**Avalon Corp.**	New York
212	**Barrett Resources Corp.**	Denver
214	**Baruch-Foster Corp.**	Dallas
292	**Basic Earth Science Systems Inc.**	Englewood, CO
141	**Beard Co.**	Oklahoma City
228	**Belcor Inc.**	Irvine, CA
204	**Belden & Blake Energy Co.**	North Canton, OH
258	**Bellwether Exploration Co.**	Houston
393	**Bengal Oil & Gas Corp.**	London, U.K.
139	**Berry Petroleum Co.**	Taft, CA
45	**BHP Petroleum (Americas) Inc.**	Houston
365	**Big Piney Oil & Gas Co.**	Salt Lake City
380	**Bogert 1985-III L.P.**	Oklahoma City
156	**Bogert Oil Co.**	Oklahoma City
385	**Bolyard Oil & Gas Ltd.**	Denver
7	**BP America**	Cleveland
219	**Bridge Oil (USA) Inc.**	San Antonio
248	**Brock Exploration Corp.**	New Orleans
343	**Broken Arrow Petroleum Co.**	Scottsdale, AZ
297	**Burton/Hawks Inc.**	Casper, WY
42	**Cabot Corp.**	Waltham, MA
361	**Calcasieu Real Estate & Oil Co. Inc.**	Lake Charles, LA
178	**Callon Consolidated Partners L.P.**	Natchez, MS
229	**Callon Petroleum Co.**	Natchez, MS
154	**Calumet Industries Inc.**	Chicago
367	**Cap Ltd.**	Oklahoma City
387	**Carmel Energy Inc.**	Houston
264	**Castle Energy Corp.**	Blue Bell, PA
359	**Castle Royalty L.P.**	Kansas City, MO
62	**CENEX**	St. Paul, MN
330	**Chaparral Resources Inc.**	Denver
181	**Chapman Energy Inc.**	Dallas
3	**Chevron Corp.**	San Francisco
373	**Cheyenne Resources Inc.**	Cheyenne, WY
133	**Chieftain Development Co. Ltd.**	Edmonton, Alta., Can.
163	**Clinton Gas Systems Inc.**	Columbus, OH
17	**Coastal Corp.**	Houston
259	**Cobb Resources Corp.**	Albuquerque
189	**Coho Resources Inc.**	Dallas
18	**Columbia Gas System Inc.**	Wilmington, DE
221	**Columbian Energy Co. L.P.**	Topeka, KS
358	**Columbine Exploration Corp.**	Denver
310	**Comstock Resources Inc.**	Dallas
261	**Com-Tek Resources Inc.**	Denver
16	**Conoco Inc.**	Houston
101	**Conquest Exploration Co.**	Houston
199	**Consolidated Energy Partners L.P.**	Denver
22	**Consolidated Natural Gas Co.**	Pittsburgh
132	**Consolidated Oil & Gas Inc.**	Denver
267	**ConVest Energy Corp.**	Houston
202	**ConVest Energy Partners Ltd.**	Houston
275	**Credo Petroleum Corp.**	Denver
334	**Crescent Oil & Gas Corp.**	Denver
131	**Crystal Oil Co.**	Shreveport
80	**CSX Oil & Gas Corp.**	Houston
227	**Daleco Resources Corp.**	Los Angeles
307	**Dallas Oil & Minerals Inc.**	Fort Worth
96	**Damson Energy Co. L.P.**	New York
138	**Damson Income Energy L.P.**	New York
145	**Damson Institutional Energy L.P.**	New York
115	**Damson Oil Corp.**	New York
87	**Dekalb Energy Cos.**	Dekalb, IL
193	**Deminex US Oil Co.**	Dallas
184	**Devon Resource Investors L.P.**	Oklahoma City
173	**DI Industries Inc.**	Houston
82	**Diamond Shamrock Offshore Partners**	Dallas
58	**Diversified Energies Inc.**	Minneapolis
376	**DOL Resources Inc.**	Dallas
245	**Dorchester Hugoton Ltd.**	Dallas
341	**Double Eagle Petroleum & Mining Co.**	Casper, WY
388	**Eagle Exploration Co.**	Denver
293	**Eglington Oil & Gas Corp.**	Fort Worth
377	**EMC Energies Inc.**	Casper, WY
322	**Energetics Inc.**	Englewood, CO
233	**Energy Assets International Corp.**	Houston
315	**Energy Capital Development Corp.**	Rosslyn, VA
242	**Energy Management Corp.**	Denver
354	**Energy Resources of North Dakota Inc.**	Williston, ND
299	**Energy Sources Inc.**	Lubbock, TX
183	**Enex Resources Corp.**	Kingwood, TX
15	**Enron Corp.**	Houston
23	**Enserch Corp.**	Dallas
46	**Enserch Exploration Partners Ltd.**	Dallas
119	**Ensource Inc.**	Houston
197	**Equitable Petroleum Corp.**	New York
54	**Equitable Resources Inc.**	Pittsburgh
151	**Equity Oil Co.**	Salt Lake City
169	**Ethyl Corp. (Oil & Gas Division)**	Baton Rouge, LA
246	**Evergreen Resources Inc.**	Denver
364	**Exploration Co.**	San Antonio
140	**Exploration Co. of Louisiana Inc.**	Lafayette, LA
1	**Exxon Corp.**	New York
254	**Falcon Oil & Gas Co. Inc.**	Odessa, TX
195	**Federated Natural Resources Corp.**	Traverse City, MI
190	**Fidelity Oil Co.**	Bismarck, ND
86	**First Mississippi Corp.**	Jackson, MS
128	**Flag Redfern Oil Co.**	Midland
71	**Forest Oil Corp.**	Denver
49	**Freeport-McMoRan Energy Part.**	New Orleans
25	**Freeport-McMoRan Inc.**	New Orleans
148	**Freeport-McMoRan Oil & Gas Royalty Trust**	Houston
174	**Fuel Resources Development Co.**	Denver
164	**Fuel Resources Inc.**	Staten Island, NY
225	**Garnet Resources Corp.**	Houston
171	**General Energy Development Ltd.**	Houston
357	**General Energy Resources & Tech. Corp.**	Traverse City, MI
220	**Goodyne Resources Inc.**	Tulsa
282	**GeoResources Inc.**	Williston, ND
368	**Gladstone Resources Inc.**	Dallas
44	**Global Marine Inc.**	Houston
106	**Global Natural Resources Inc.**	Houston
285	**Gold King Consolidated Inc.**	Denver
281	**Golden Oil Co.**	Denver
372	**Golden Triangle Royalty & Oil Inc.**	Cisco, TX
57	**Grace Natural Resources Group**	Dallas
271	**Graham Income Fund 82A L.P.**	Covington, LA
160	**Graham-McCormick Oil & Gas Partnership**	Covington, LA
309	**Great Eastern Energy & Development Corp.**	Englewood, CO
308	**Greenwood Holdings Inc.**	Englewood, CO
97	**Hadson Corp.**	Oklahoma City
353	**Hailey Energy Corp.**	Abilene, TX
55	**Hamilton Oil Corp.**	Denver
335	**HarCor Energy Inc.**	Beverly Hills, CA
113	**Harken Oil & Gas Inc.**	Bedford, TX
66	**Helmerich & Payne Inc.**	Tulsa
217	**Hershey Oil Corp.**	Pasadena, CA
399	**Hipoint Investments Ltd.**	Oklahoma City
103	**Home Petroleum Corp.**	Denver
272	**Home-Stake Oil & Gas Co.**	Tulsa
240	**Home-Stake Royalty Corp.**	Tulsa
287	**Houston Oil Royalty Trust**	Houston
153	**Houston Oil Trust**	Houston
108	**Howell Corp.**	Houston
370	**Hubco Exploration Inc.**	New Orleans
146	**Hutton/Energy Assets 3rd Energy Ptrsp. A Ltd.**	Houston
205	**ICG Petroleum Inc.**	Calgary, Alta., Can.
331	**Impact Energy Inc.**	Fort Worth
130	**Integrated Drilling & Exploration Inc.**	Tulsa
325	**International Basic Resources Inc.**	Tucson
369	**International Management & Research Corp.**	Philadelphia
384	**International Royalty & Oil Co.**	Fort Worth
342	**Intramerican Oil & Minerals Inc.**	Dallas
114	**Kaneb Energy Partners Ltd.**	Richardson, TX
77	**Kaneb Services Inc.**	Richardson, TX
339	**Keldon Oil Co.**	San Clemente, CA
289	**Kelley Oil Corp.**	Houston
170	**Kelley Oil & Gas Partners Ltd.**	Houston
211	**KenCope Energy Cos.**	San Antonio
27	**Kerr-McGee Corp.**	Oklahoma City
238	**Kimbark Oil & Gas Co.**	Denver
319	**Kimco Energy Corp.**	Arlington, TX
134	**Kirby Exploration Co. Inc.**	Houston
316	**K.R.M. Petroleum Corp.**	White Plains, NY
203	**LL&E Royalty Trust**	Houston
389	**Lech Exploration Inc.**	Gainesville, TX
274	**Lomak Petroleum Inc.**	Hartville, OH
39	**Louisiana Land & Exploration Co.**	New Orleans
379	**Love Oil Co. Inc.**	Denver
360	**Lyric Energy Inc.**	Amarillo
298	**Magic Circle Energy Corp.**	Oklahoma City
34	**Maxus Energy Corp.**	Dallas
175	**Maynard Oil Co.**	Dallas
182	**McFarland Energy Inc.**	Santa Fe Springs, CA
144	**MCO Resources Inc.**	Houston
30	**Meridian Oil Inc.**	Houston
28	**Mesa L.P.**	Amarillo
236	**Michigan Oil Co.**	Jackson, MI
391	**Minex Resources Inc.**	Riverton, WY
31	**Mitchell Energy & Development Corp.**	The Woodlands, TX
2	**Mobil Corp.**	New York
311	**Monogram Oil & Gas Inc.**	North Canton, OH
36	**Montana Power Co.**	Butte, MT
109	**Moore McCormack Energy Inc.**	Dallas
366	**Morrison Nuclear Inc.**	Calgary, Alta., Can.
196	**MSR Exploration Ltd.**	Cut Bank, MT
32	**Murphy Oil Corp.**	El Dorado, AR
284	**Mustang Cos. Inc.**	Great Bend, KS
208	**Mustang Resources Corp.**	Houston
273	**Nahama & Weagant Energy Co.**	Bakersfield, CA
84	**National Cooperative Refinery Assoc.**	McPherson, KS
47	**National Fuel Gas Co.**	New York
390	**National Petroleum Corp. Ltd.**	Dallas
123	**Nerco Oil & Gas Inc.**	Vancouver, WA

The OGJ400 Company Index continued

Rank by total assets	Company name	Headquarters city
60	**Newmont Oil Co.**	New York
121	**NGC Energy Co.**	Concord, CA
33	**Nicor Inc.**	Naperville, IL
68	**Noble Affiliates Inc.**	Ardmore, OK
122	**Noble Drilling Corp.**	Tulsa
99	**NOMECO**	Jackson, MI
100	**Norcen Energy Resources Ltd.**	Calgary, Alta., Can.
302	**Normandy Oil & Gas Co. Inc.**	Fort Worth
347	**Nova Natural Resources Corp.**	Salt Lake City
332	**NP Energy Corp.**	Los Angeles
79	**NRM Energy Co. L.P.**	Dallas
201	**Nucorp Energy Inc.**	Chicago
250	**Nugget Oil Corp.**	Bloomington, MN
94	**NUI Corp.**	Bridgewater, NJ
270	**N.Y. Life Oil & Gas Prod. Prop. II-A L.P.**	Houston
300	**N.Y. Life Oil & Gas Prod. Prop. I-A L.P.**	Houston
324	**N.Y. Life Oil & Gas Prod. Prop. I-B L.P.**	Houston
268	**N.Y. Life Oil & Gas Prod. Prop. I-C L.P.**	Houston
303	**N.Y. Life Oil & Gas Prod. Prop. I-D L.P.**	Houston
10	**Occidental Petroleum Corp.**	Los Angeles
53	**Ocean Drilling & Exploration Co.**	New Orleans
397	**Oil City Petroleum Inc.**	Tulsa
168	**OKC L.P.**	Dallas
286	**Omni Exploration Inc.**	Columbus, OH
56	**Oneok Inc.**	Tulsa
172	**Oregon Natural Gas Development Corp.**	Portland, OR
362	**Oxford Consolidated Inc.**	Denver
179	**Oxoco Inc.**	Houston
74	**Pacific Enterprises Oil & Gas Co.**	Los Angeles
162	**PaineWebber/Geodyne Energy Income L.P. II-A**	Tulsa
187	**PaineWebber/Geodyne Energy Income L.P. II-B**	Tulsa
283	**Panhandle Royalty Co.**	Oklahoma City
337	**Pantepec International Inc.**	Woodbridge, CT
313	**Parallel Petroleum Corp.**	Midland
117	**Parker & Parsley Development Partners L.P.**	Midland
110	**Park-Ohio Industries Inc.**	Cleveland
288	**Partners Oil Co.**	Houston
142	**Patrick Petroleum Co.**	Jackson, MI
149	**Pauley Petroleum Inc.**	Los Angeles
90	**Pelto Oil Co.**	Houston
167	**Pend Oreille Oil & Gas Co.**	Houston
180	**Penn Virginia Resources Corp.**	Duffield, VA
24	**Pennzoil Co.**	Houston
340	**Penn-Pacific Corp.**	Newport Beach, CA
255	**Permian Basin Royalty Trust**	Fort Worth
350	**Petrol Industries Inc.**	Shreveport
200	**Petroleum Development Corp.**	Bridgeport, WV
213	**Petroleum Investments Ltd.**	Oklahoma City
296	**Petroleum Reserve Corp.**	Tulsa
224	**Petromark Resources Co.**	Tulsa
247	**Petrominerals Corp.**	Stanton, CA
12	**Phillips Petroleum Co.**	Bartlesville, OK
295	**Pinnacle Petroleum Inc.**	The Woodlands, TX
352	**Pioneer Oil & Gas Corp.**	Midvale, UT
185	**Plains Petroleum Co.**	Lakewood, CO
135	**Plains Resources Inc.**	Oklahoma City
345	**Plano Petroleum Corp.**	Plano, TX
294	**Plexus Resources Corp.**	Salt Lake City
67	**Pogo Producing Co.**	Houston
102	**Prairie Producing Co.**	Houston
239	**Premier Resources Ltd.**	Denver
116	**Presidio Oil Co.**	Englewood, CO
291	**Prima Energy Corp.**	Denver
41	**Primark Corp.**	McLean, VA
92	**Primary Fuels Inc.**	Houston
157	**Prudential-Bache Energy Income L.P. IIIP-12**	Covington, LA
177	**Prudential-Bache Energy Income L.P. IIIP-13**	Covington, LA
150	**Prudential-Bache Energy Income L.P. IIIP-14**	Covington, LA
155	**Prudential-Bache Energy Income L.P. IIIP-15**	Covington, LA
206	**Prudential-Bache Energy Income L.P. IIP-10**	Covington, LA
216	**Prudential-Bache Energy Income L.P. IIP-11**	Covington, LA
237	**Prudential-Bache Energy Income L.P. IIP-4**	Covington, LA
241	**Prudential-Bache Energy Income L.P. IIP-5**	Covington, LA
244	**Prudential-Bache Energy Income L.P. IIP-6**	Covington, LA
235	**Prudential-Bache Energy Income L.P. IIP-7**	Covington, LA
198	**Prudential-Bache Energy Income L.P. IIP-8**	Covington, LA
222	**Prudential-Bache Energy Income L.P. IIP-9**	Covington, LA
129	**Prudential-Bache Energy Income L.P. IVP-16**	Covington, LA
125	**Prudential-Bache Energy Income L.P. IVP-17**	Covington, LA
137	**Prudential-Bache Energy Income L.P. VP-18**	Covington, LA
126	**Prudential-Bache Energy Income L.P. VP-19**	Covington, LA
279	**Pyramid Oil Co.**	Bakersfield, CA
105	**Pyro Energy Corp.**	Evansville, IN
266	**QED Exploration Inc.**	Denver
231	**Quadra Oil & Gas Inc.**	Denver
64	**Quaker State Corp.**	Oil City, PA
329	**Questa Oil & Gas Co.**	Littleton, CO

The OGJ400 Company Index continued

Rank by total assets	Company name	Headquarters city
51	**Questar Corp.**	Salt Lake City
93	**Quinoco Cos.**	Denver
83	**Ram Industries Inc.**	Dallas
317	**Ranger Oil Ltd.**	Calgary, Alta., Can.
269	**Ratex Resources Inc.**	Oklahoma City
61	**Reading & Bates Corp.**	Tulsa
232	**Red Eagle Resources Corp.**	Oklahoma City
383	**REO Production I-A L.P.**	Oklahoma City
290	**Republic Resources Corp.**	Oklahoma City
374	**Reserve Exploration Co.**	Tulsa
223	**Resource Exploration Inc.**	Akron, OH
348	**Roberts Oil & Gas Inc.**	Houston
346	**Roseland Oil & Gas Inc.**	Tyler, TX
400	**Rotan Mosle Energy Fund III Ltd.**	Houston
89	**Sabine Corp.**	Dallas
226	**Sabine Royalty Trust**	Dallas
249	**Sage Drilling Co. Inc.**	Wichita
118	**Sage Energy Co.**	San Antonio
176	**Samson Energy Co.**	Tulsa
124	**San Juan Basin Royalty Trust**	Fort Worth
50	**Santa Fe Energy Co.**	Houston
78	**Santa Fe Energy Partners L.P.**	Houston
188	**Saxon Oil Co.**	Dallas
194	**Saxon Oil Development Partners L.P.**	Dallas
88	**Seagull Energy Corp.**	Houston
251	**Seahawk Oil International Inc.**	Newport Beach, CA
277	**Search Natural Resources Inc.**	Dallas
318	**Senergy 1986 Ltd.**	Houston
375	**Sharon Energy Ltd.**	Englewood, CO
371	**Sheffield Exploration Co. Inc.**	Denver
5	**Shell Oil Co.**	Houston
104	**Snyder Oil Partners L.P.**	Fort Worth
26	**Sonat Inc.**	Birmingham, AL
320	**Southern Mineral Corp.**	Houston
81	**Southern Union Co.**	Dallas
91	**Southwestern Energy Co.**	Fayetteville, AR
107	**Statex Petroleum Inc.**	San Diego
301	**Strata Corp.**	Columbus, OH
278	**Striker Petroleum Corp.**	Englewood, CO
356	**Struthers Oil & Gas Corp.**	Tulsa
257	**Summit Energy Inc.**	Dallas
349	**Summit Petroleum Corp.**	Abilene, TX
11	**Sun Co.**	Radnor, PA
76	**Sunshine Mining Co.**	Dallas
209	**Swift Energy Co.**	Houston
210	**Taurus Exploration Inc.**	Birmingham, AL
344	**Taurus Petroleum Inc.**	Denver
9	**Tenneco Inc.**	Houston
65	**Tesoro Petroleum Corp.**	San Antonio
4	**Texaco Inc.**	White Plains, NY
143	**Texas American Energy Corp.**	Far Hills, NJ
159	**Texas International Co.**	Oklahoma City
386	**Texas Vanguard Oil Co.**	Austin, TX
392	**Texoil Inc.**	Jacksboro, TX
234	**Texon Energy Corp.**	Houston
95	**TGX Corp.**	Houston
158	**Thermal Exploration Co.**	Seattle
253	**Thor Energy Resources Inc.**	Tyler, TX
75	**Tidewater Inc.**	New Orleans
186	**Tipperary Corp.**	Midland
378	**Toklan Oil Corp.**	Tulsa
136	**Tom Brown Inc.**	Midland
85	**Total Minatome Corp.**	Houston
52	**Total Petroleum (North America) Ltd.**	Denver
381	**TPEX Exploration Inc.**	Denver
20	**Transco Energy Co.**	Houston
48	**Transco Exploration Partners Ltd.**	Houston
256	**Trinity Resources Ltd.**	Houston
70	**Triton Energy Corp.**	Dallas
394	**Tri-Valley Corp.**	Bakersfield, CA
218	**Tucker Drilling Co. Inc.**	San Angelo, TX
355	**Twin Richfield Oils Inc.**	Calgary, Alta., Can.
321	**Tyrex Oil Co.**	Casper, WY
63	**Unimar Co.**	Tarrytown, NY
40	**Union Exploration Partners Ltd.**	Los Angeles
35	**Union Pacific Resources Co.**	Fort Worth
38	**Union Texas Petroleum Holdings Inc.**	Houston
152	**Unit Corp.**	Tulsa
14	**Unocal Corp.**	Los Angeles
305	**Usenco Inc.**	Fort Worth
13	**USX (Oil & Gas Segment)**	Pittsburgh
328	**Valex Petroleum Inc.**	Fort Worth
243	**Vermilion Bay Land Co.**	Lafayette, LA
112	**Wainoco Oil Corp.**	Houston
192	**Walker Energy Partners**	Houston
314	**Wepco Energy Co.**	Denver
262	**Western Energy Development Co. Inc.**	Denver
336	**Western Energy Resources Inc.**	Mission Viejo, CA
312	**Wexco of Delaware Inc.**	Milwaukee
280	**Whiting Petroleum Corp.**	Denver
252	**Wichita River Oil Co.**	Denver
382	**Wickland Holding Co.**	Bloomfield Hills, MI
363	**Willard Pease Oil & Gas Co.**	Grand Junction, CO
161	**Wilshire Oil Co. of Texas**	Jersey City, NJ
395	**Winco Petroleum Corp.**	Denver
120	**Wiser Oil Co.**	Sistersville, WV
166	**Wolverine Exploration Co.**	Fort Worth
306	**Woodbine Petroleum Inc.**	Dallas
326	**Wright Brothers Energy Inc.**	San Antonio
263	**Xplor Corp.**	New York
398	**Yellowstone Resources Inc.**	Denver
59	**Zapata Corp.**	Houston
260	**ZB Energy Corp.**	Tulsa

CRUDE OIL ASSAYS

Key to the assays . . .

Each assay is headed, in the following order, by the official name of the crude, the former or secondary name in parenthesis, the country of origin, and location and type loading facilities. Loading systems that frequently crop up are abbreviated. Those used are CBM (conventional buoy mooring), SPM (single point mooring), SBM (single buoy mooring), CALM (catenary anchor leg mooring), and SALM (single anchor leg mooring).

Mideast

Aboozar (Ardeshir), Iran

Terminal Kharg Island

Crude
Gravity, °API: 26.9
Sulfur, wt %: 2.48
Rvp, psi: 5.5
H_2S (dissolved) wt %: 0.031
H_2S (evolved) wt %: 0.089
Pour pt, °F.: −30
Salt, lb/1,000 bbl: 55.0
Neutralization value, mg KOH/g: 1.96
Rams. carbon, wt %: 5.9
Kin. vis., cSt @ 68° F.: 36.58
@ 122° F.: 12.76
V/Ni, ppm: 71/21
Light hydrocarbons, vol %: 3.86

Naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 5.5
Gravity, °API: 80.2
Sulfur (total) wt %: 0.090
Mercaptan S, wt %: 0.044
Rvp, psi: 10.3
Paraffins, vol %: 72.6
Naphthenes, vol %: 24.2
Aromatics, vol %: 3.1
RON, clear: 71.7
MON, clear: 67.9

Naphtha
Range (TBP), °F.: 200-320
Yield, vol %: 8.4
Gravity, °API: 55.7
Sulfur (total) wt %: 0.097
Mercaptan S, wt %: 0.027
Rvp, psi: 1.0
P/N/A, vol %: 60.1/27.3/12.7
RON, clear: 45.7
MON, clear: 44.3

Naphtha
Range (TBP), °F. 320-360
Yield, vol %: 3.8
Gravity, °API: 48.6
Sulfur (total), wt %: 0.158
Mercaptan S, wt %: 0.023
P/N/A, vol %: 59.1/25.8/15.1
RON, clear: 30.2
MON, clear: 31.4

Kerosine
Range (TBP), °F.: 360-520
Yield, vol %: 14.4
Gravity, °API: 41.9
Sulfur (total), wt %: 0.452
Mercaptan S, wt %: 0.015
Aniline pt, °F.: 143.9
Diesel index: 60.2
Cetane index: 49.3
Freeze pt, °F.: −32
Cloud pt, °F.: −49
Pour pt, °F.: −52
Smoke pt, mm: 20

Gas oil
Range (TBP), °F.: 520-650
Yield, vol %: 12.7
Gravity, °API: 33.4
Sulfur (total), wt %: 1.274
Charac. factor: 11.74
Aniline pt, °F.: 158.8
Diesel index: 53.0
Cetane index: 52.7
Cloud pt, °F.: 21
Pour pt, °F.: 18
Vis., SUS @ 100° F.: 40.4
@ 122° F.: 37.1

Residuum
Range (TBP), °F.: 650+
Yield, vol %: 53.5
Gravity, °API: 12.5
Sulfur (total), wt %: 3.804
Pour pt, °F.: 56
Rams. carbon, wt %: 10.0
Vis., SUS @ 122° F.: 12,303.9
@ 210° F.: 465.9
V/Ni, ppm: 120/36

Residuum
Range (TBP), °F.: 1,050+
Yield, vol %: 24.2
Gravity, °API: 3.5
Sulfur (total), wt %: 5.069
Pour pt, °F.: 210
Rams. carbon, wt %: 19.6
Vis., SUS @ 210° F.: 125,012.7
V/Ni, ppm: 244/74

Abu Al Bu Khoosh, Abu Dhabi, U.A.E.

Storage tanker offshore producing area

Crude
Gravity, °API: 31.6
Sulfur, wt %: 2.0
Pour pt, °C.: −12 (−24.5° F.)
Kin. vis., 37.8° C. cSt: 6.7
Con. carbon, wt %: 4.3
Rvp, psi: 3.5
V/Ni, ppm: 12/7
Ibp-15° C. yield, wt %: 0.59
vol %: 0.69

Light naphtha
Range, °C.: 15-65
Yield, wt %: 2.74
vol %: 3.59
Gravity, °API: 88.7
Sulfur, wt %: 0.03
Mercaptans, ppm: 325
Paraffins, vol %: 95
Naphthenes, vol %: 4.4
Aromatics, vol %: 0.06
RON, clear: 74
RON + 3 ml TEL: 94.5

Heavy naphtha
Range, °C.: 65-165
Yield, wt %: 14.45
vol %: 16.83
Gravity, °API: 59.6
Sulfur, wt %: 0.05
Mercaptans, ppm: 276
P/N/A, vol %: 68.3/18.5/13.2

Kerosine
Range, °C.: 165-230
Yield, wt %: 11.52
vol %: 12.53
Gravity, °API: 46.25
Sulfur, wt %: 0.16
Mercaptans, ppm: 182
P/N/A, vol %: 55.5/21.8/22.7
Freezing pt, °C.: −52.5
Aniline pt, °C.: 56.4
Diesel index: 61.7
Smoke pt, mm: 23

Light gas oil
Range, °C.: 230-300
Yield, wt %: 12.5
vol %: 12.96
Gravity, °API: 37.5
Sulfur, wt %: 0.85
Pour pt, °C.: −27
Cloud pt, °C.: −19
Aniline pt, °C.: 65
Diesel index: 55.9
Kin. vis., cSt @ 37.8° C.: 2.63

Heavy gas oil
Range, °C.: 300-375
Yield, wt %: 13.83
vol %: 12.71
Gravity, °API: 30.3
Sulfur, wt %: 1.9
Pour pt, °C.: +2
Cloud pt, °C.: +7
Aniline pt, °C.: 72.2
Diesel index: 49.1
Kin. vis., cSt @ 37.8° C.: 6.92

Distillate
Range, °C.: 375-550
Yield, wt %: 26.63
vol %: 24.95
Gravity, °API: 21.4

Sulfur, wt %: 2.67
Pour pt, °C.: +26
Cloud pt, °C.: +28
Con. carbon, wt %: 0.7
Kin. vis., cSt @ 50° C.: 40.96
@ 98.9° C.: 7.89

Residue
Range, °C.: 375+
Yield, wt %: 45.37
vol %: 40.69
Gravity, °API: 14.9
Sulfur, wt %: 3.4
Pour pt, °C.: +21
Asphaltenes, wt %: 3.1
V/Ni, ppm: 30/14
Kin. vis., cSt @ 50° C.: 435
@ 98.9° C.: 40.3

Residue
Range, °C.: 550+
Yield, wt %: 18.7
vol %: 15.7
Gravity, °API: 4.3
Sulfur, wt %: 4.4
Pour pt, °C.: +50
Asphaltenes, wt %: 9.2
V/Ni, ppm: 67/35
Kin. vis., cSt @ 98.9° C.: 1,860
Pen. at 25° C.: 125

Arabian Heavy (Safaniya), Saudi Arabia

Ras Tanura

Crude
Gravity, °API: 27.9
Sulfur, wt %: 2.85
Pour pt, °F.: −20
Rvp, psi: 7.5
Kin. vis., cSt @ 70° F.: 37.0
@ 100° F.: 19.0

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 7.9
Gravity, °API: 79.9
Sulfur, wt %: 0.0059
Rvp, psi: 8.5
Paraffins, vol %: 88.6
Naphthenes, vol %: 10.2
Aromatics, vol %: 1.2
RON, clear: 58.0

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 6.8
Gravity, °API: 60.5
Sulfur, wt %: 0.016
P/N/A, vol %: 70.8/19.5/9.7

Kerosine
Range, °FVT: 302-455
Yield, vol %: 12.4
Gravity, °API: 48.4
Sulfur, wt % 0.16
Aromatics, vol %: 18.9
Freeze pt °F.: −67
Smoke pt, mm: 26
Luminometer no.: 57
Aniline pt, °F.: 141
Kin. vis., cSt @ −30° F.: 5.14
@ 100° F.: 1.14

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 16.5
Gravity, °API: 35.2
Sulfur, wt %: 1.30
Pour pt, °F.: 5
Aniline pt, °F.: 154
Kin. vis., cSt @ 100° F.: 3.45
@ 210° F.: 1.30

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 30.6
Gravity, °API: 20.9
Sulfur, wt %: 2.92
Pour pt, °F.: 95
Aniline pt, °F.: 173
Kin. vis., cSt @ 100° F.: 77.0
@ 210° F.: 8.46

Residual oil
Range, °FVT: 650+
Yield, vol %: 53.8
Gravity, °API: 12.6
Sulfur, wt %: 4.34
Pour pt, °F.: 60
Con. carbon, wt %: 13.3
Kin. vis., cSt @ 100° F.: 4,103
@ 210° F.: 94.2

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 23.2
Gravity, °API: 3.0
Sulfur, wt %: 6.0
Pour pt, °F.: 120+
Con. carbon, wt %: 27.7
Kin. vis., cSt @ 210° F.: 55,292
Furol, sec @ 275° F.: 1,309
V/Ni/Fe, ppm: 205/64/30

Arabian Light, Saudi Arabia

Ras Tanura and Yanbu also Sidon, Lebanon

Crude
Gravity, °API: 33.4
Sulfur, wt %: 1.79
Pour pt, °F.: −30
Rvp, psi: 3.6
Kin. vis., cSt @ 70° F.: 10.2
@ 100° F.: 6.25

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 78.4
Sulfur, wt %: 0.024
Rvp, psi: 8.2
Paraffins, vol %: 86.8
Naphthenes, vol %: 10.7
Aromatics, vol %: 2.5
RON, clear: 55.0

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 8.5
Gravity, °API: 59.3
Sulfur, wt %: 0.027
P/N/A, vol %: 68.3/19.0/12.7

Kerosine
Range, °FVT: 302-455
Yield, vol %: 16.5
Gravity, °API: 48.0
Sulfur, wt %: 0.084
Aromatics, vol %: 20.6
Freeze pt, °F.: −71
Smoke pt, mm: 23
Luminometer no.: 51
Aniline pt, °F.: 138
Kin. vis., cSt @ −30° F.: 5.39
@ 100° F.: 1.13

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 19.7
Gravity, °API: 36.5
Sulfur, wt %: 1.03
Pour pt, °F.: 5
Aniline pt, °F.: 158
Kin. vis., cSt @ 100° F.: 3.35
@ 210° F.: 1.30

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 29.8
Gravity, °API: 22.9
Sulfur, wt %: 2.41
Pour pt, °F.: 95
Aniline pt, °F.: 180
Kin. vis., cSt @ 100° F.: 55.5
@ 210° F.: 6.89

Residual oil
Range, °FVT: 650+
Yield, vol %: 44.6
Gravity, °API: 17.2
Sulfur, wt %: 3.1
Pour pt, °F.: 35
Con. carbon, wt %: 7.6
Kin. vis., cSt @ 100° F.: 414.3
@ 210° F.: 24.2

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 14.8
Gravity, °API: 6.9
Sulfur, wt %: 4.34
Pour pt, °F.: 115
Con. carbon, wt %: 20.3
Kin. vis., cSt @ 210° F.: 1,589
Furol, sec @ 275° F.: 104
V/Ni/Fe, ppm: 116/25/114

Arabian Light (Berri), Saudi Arabia

Ras Tanura

Crude
Gravity, °API: 37.8
Sulfur, wt %: 1.19
Pour pt, °F.: −25
Rvp, psi: 4.0
Kin. vis., cSt @ 70° F.: 5.80
@ 100° F.: 3.86

Light Naphtha
Range, °FVT: 68-212
Yield, vol %: 10.1
Gravity, °API: 78.4
Sulfur, wt %: 0.071
Rvp, psi: 6.9
Paraffins, vol %: 87.4
Naphthenes, vol %: 11.2
Aromatics, vol %: 1.4
RON, clear: 50.0

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 8.7
Gravity, °API: 58.2
Sulfur, wt %: 0.053
P/N/A, vol %: 65.3/20.4/14.3

Kerosine
Range, °FVT: 302-455
Yield, vol %: 18.7
Gravity, °API: 48.4
Sulfur, wt %: 0.090
Aromatics, vol %: 19.9
Freeze pt, °F.: −71
Smoke pt, mm: 25
Luminometer no.: 54
Aniline pt, °F.: 136
Kin. vis., cSt @ −30° F.: 4.79
@ 100° F.: 1.10

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 21.2
Gravity, °API: 37.3
Sulfur, wt %: 0.72
Pour pt, °F.: 10
Aniline pt, °F.: 161
Kin. vis., cSt @ 100° F.: 3.4
@ 210° F.: 1.28

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 30.3
Gravity, °API: 25.1
Sulfur, wt %: 1.83
Pour pt, °F.: 95
Aniline pt, °F.: 192
Kin. vis., cSt @ 100° F.: 44.4
@ 210° F.: 6.25

Residual oil
Range, °FVT: 650+
Yield, vol %: 39.3
Gravity, °API: 21.6
Sulfur, wt %: 2.09
Pour pt, °F.: 70
Con. carbon, wt %: 4.2
Kin. vis., cSt @ 100° F.: 128.1
@ 210° F.: 12.34

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 9.0
Gravity, °API: 11.0
Sulfur, wt %: 2.88
Pour pt, °F.: 80
Con. carbon, wt %: 16.2
Kin. vis., cSt @ 210° F.: 396.9
Furol, sec @ 275° F.: 38.2
V/Ni, ppm: 9/6
Aromatics, ppm: 46

Arabian Medium (Khursaniyah), Saudi Arabia

Ras Tanura

Crude
Gravity, °API: 30.8
Sulfur, wt %: 2.40
Pour pt, °F.: +5
Rvp, psi: 3.2
Kin. vis., cSt @ 70° F.: 16.2
@ 100° F.: 9.41

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 77.7
Sulfur, wt %: 0.043
Rvp, psi: 7.9
Paraffins, vol %: 85.3
Naphthenes, vol %: 12.3
Aromatics, vol %: 2.4
RON, clear: 54.5

Heavy naphtha
Range, °FVT: 212-302
Yield, vol %: 7.7
Gravity, °API: 59.1
Sulfur, wt %: 0.050
P/N/A, vol %: 68.5/18.8/12.7

Kerosine
Range, °FVT: 302-455
Yield, vol %: 14.5
Gravity, °API: 48.0
Sulfur, wt %: 0.14
Aromatics, vol %: 20.6
Freeze pt, °F.: −62
Smoke pt, mm: 23
Luminometer no.: 52
Aniline pt, °F.: 136
Kin. vis., cSt @ −30° F.: 5.10
@ 100° F.: 1.13

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 18.1
Gravity, °API: 36.0
Sulfur, wt %; 1.24
Pour pt, °F.: 15
Aniline pt, °F.: 157
Kin. vis., cSt @ 100° F.: 3.53
@ 210° F.: 1.32

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 30.9
Gravity, °API: 21.9
Sulfur, wt %: 2.91
Pour pt, °F.: 100
Aniline pt, °F.: 176
Kin. vis., cSt @ 100° F.: 49.2
@ 210° F.: 6.40

Residual oil
Range, °FVT: 650+
Yield, vol %: 49.6
Gravity, °API: 15.0
Sulfur, wt %: 3.90
Pour pt, °F.: 55
Con. carbon, wt %: 9.9
Kin. vis., cSt @ 100° F.: 850
@ 210° F.: 36.0

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 18.7
Gravity, °API: 4.9
Sulfur, wt %: 5.35
Pour pt, ° F.: 115
Con. carbon, wt %: 23.3
Kin. vis., cSt @ 210° F.: 3,847
Furol, sec @ 275° F.: 226
V/Ni/Fe, ppm: 96/32/30

Arabian Medium (Zuluf/Marjan), Saudi Arabia

Juayma

Crude
Gravity, °API: 31.1
Sulfur, wt %: 2.48
Pour pt, °F.: −20
Rvp, psi: 8.3
Kin. vis., cSt @ 70° F.: 19.4
@ 100° F.: 11.01

Light naphtha
Range, °FVT: 68-212
Yield, vol %: 8.9
Gravity, °API: 79.7
Sulfur, wt %: 0.0069
Rvp, psi: 9.1
Paraffins, vol %: 89.3
Naphthenes, vol %: 9.6
Aromatics, vol %: 1.1
RON, clear: 58.6

Heavy naphtha
Range, °FVT: 212-302
Yield, vol % on crude: 8.2
Gravity, °API: 60.2
Sulfur, wt %: 0.024
P/N/A, vol %: 69.3/20.2/10.5

Kerosine
Range, °FVT: 302-455
Yield, vol %: 14.1
Gravity, °API: 48.3
Sulfur, wt %: 0.14
Aromatics, vol %: 17.2
Freeze pt, °F.: −72
Smoke pt, mm: 26
Luminometer no.: 59
Aniline pt, °F.: 139
Kin. vis., cSt @ −30° F.: 5.01
@ 100° F.: 1.13

Light gas oil
Range, °FVT: 455-650
Yield, vol %: 17.6
Gravity, °API: 36.1
Sulfur, wt %: 1.25
Pour pt, °F.: 10
Aniline pt, °F.: 158
Kin. vis., cSt @ 100° F.: 3.45
@ 210° F.: 1.31

Heavy gas oil
Range, °FVT: 650-1,049
Yield, vol %: 28.2
Gravity, °API: 21.8
Sulfur, wt %: 2.90
Pour pt, °F.: 95
Aniline pt, °F.: 177
Kin. vis., cSt @ 100° F.: 72.6
@ 210° F.: 8.04

Residual oil
Range, °FVT: 650+
Yield, vol %: 48.0
Gravity, °API: 13.9
Sulfur, wt %: 4.06
Pour pt, ° F.: 55
Con. carbon, wt %: 9.4
Kin. vis., cSt @ 100° F.: 2,126
@ 210° F.: 65.9

Residual oil
Range, °FVT: 1,049+
Yield, vol %: 19.8
Gravity, °API: 3.9
Sulfur, wt %: 5.51
Pour pt, ° F.: 140
Con. carbon, wt %: 20.5
Kin. vis., cSt @ 210° F.: 20,085
Furol, sec @ 275° F.: 684
V/Ni/Fe, ppm: 179/54/40

Bahrgansar/Nowruz (SIRIP Blend), Iran

Ras Bahrgan SBM

Crude
Gravity, °API: 27.1
Sulfur, wt %: 2.45
Pour pt, °C.: −33
Vis., cSt @ 100° F.: 20.4
Con. carbon, wt %: 7.9
Rvp, kg/sq cm: 0.56
Salt, lb/1,000 bbl: 30.6
V/Ni, ppm: 72/25

Light naphtha
Range, °C.: C_5-66
Yield, wt %: 3.76
Gravity, °API: 84.3
Sulfur, wt %: 0.065
Rvp, kg/sq cm: 0.87
Paraffins, vol %: 92.3
Naphthenes, vol %: 6.3
Aromatics, vol %: 1.4
RON, clear: 67.4

Heavy naphtha
Range, °C.: 66-150
Yield, wt %: 8.59
Gravity, °API: 59.6
Sulfur, wt %: 0.06
P/N/A, vol %: 60.0/31.0/9.0
RON, clear: 48.0

Kerosine
Range, °C.: 150-250
Yield, wt %: 13.23
Gravity, °API: 46.0
Sulfur, wt %: 0.228
Aromatics, vol %: 18.5
Freezing pt, °C.: < −55
Smoke pt, mm: 22
Aniline pt, °C.: 59.8

Gas oil
Range, °C.: 250-350
Yield, wt %: 14.04
Gravity, °API: 33.6
Sulfur, wt %: 1.19
Pour pt, °C.: −12
Aniline pt, °C.: 69.2
Diesel index: 53.0

Residual oil
Range, °C.: 350+
Yield, wt %: 59.00
Gravity, °API: 11.3
Sulfur, wt %: 3.8
Pour pt, °C.: +12
Con. carbon, wt %: 13.35

Residual oil
Range, °C.: 550+
Yield, wt %: 35.90
Gravity, °API: 4.4
Sulfur, wt %: 4.84
Pour pt, °C.: > +48
Con. carbon, wt %: 21.85
V/Ni/Fe, ppm: 202/69/52

Note: Same assay first published in 1976.

Basrah Heavy, Iraq

Mina al Bakr sea terminal in Persian Gulf (Khor al Khafja)

Crude
Gravity, °API: 24.7
Sulfur, wt %: 3.5
Pour pt, °C.: −30
Kin. vis. @ 10° C., cSt: 86.3
C_4 & lighter, wt %: 0.8

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 2.6
Density @ 15° C., g/cu m: 0.648
RON + 0.4 g Pb/l: 83

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 12.2
Density @ 15° C., g/cu m: 0.74
RON + 0.4 g Pb/l: 55
Aromatics, vol %: 9.5
Naphthenes, vol %: 21

Kerosine
Range, °C.: 175-222
Yield, wt %: 6.9
Density @ 15° C., g/cu m: 0.799
Sulfur, wt %: 0.38

Gas oil
Range, °C.: 225-360
Yield, wt %: 21.6
Density @ 15° C., g/cu m: 0.871
Sulfur, wt %: 1.95
Pour pt, °C.: −16
Cold filter pour pt, °C.: −14
Kin. vis., cSt @ 100° C.: 1.42

Heavy gas oil
Range, °C.: 360-460
Yield, wt %: 13.5
Density @ 15° C., g/cu m: 0.935
Sulfur, wt %: 3.57
Kin. vis., cSt @ 100° C.: 5.20

Long residuum
Range, °C.: 360+
Yield, wt %: 55.9
Density @ 15° C., g/cu m: 1.012
Sulfur, wt %: 5.25
Kin. vis., cSt @ 100° C.: 178.2

Short residuum
Range, °C.: 460+
Yield, wt %: 42.4
Density @ 15° C., g/cu m: 1.041
Sulfur, wt %: 5.80
Kin. vis., cSt @ 100° C.: 1,350
Con. carbon, wt %: 22.0
V/Ni, ppm: 212/26
Pen. @ 25° C., 0.1 mm: 180

Basrah Light, Iraq

Marine pipeline to Khor-al-Amaya piled structure in gulf

Crude
Gravity, °API: 33.7
Sulfur, wt %: 1.95
Pour pt, °C.: −15
Kin. vis., cSt @ 10° C.: 15.0
C_4 & lighter, wt %: 1.3

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 3.7
Density @ 15° C g/cu m: 0.646
RON + 0.4 g Pb/l: 83

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 16.2
Density @ 15° C., g/cu m: 0.737
RON + 0.4 g Pb/l: 54
Aromatics, vol %: 10
Naphthenes, vol %: 17

Kerosine
Range, °C.: 175-225
Yield, wt %: 8.2
Density @ 15° C., g/cu m: 0.795
Sulfur, wt %: 0.10

Gas oil
Range, °C.: 225-360
Yield, wt %: 22.9
Density @ 15° C., g/ cu m: 0.843
Sulfur, wt %: 1.20
Pour pt, °C.: −12
CFPP, °C.: −9
Kin. vis., cSt @ 100° C.: 1.35

Heavy gas oil
Range, °C.: 360-525
Yield, wt %: 25.1
Density @ 15° C., g/cu m: 0.916
Sulfur, wt %: 2.41
Kin. vis., cSt @ 100° C.: 8.00

Long residuum
Range, °C.: 360+
Yield, wt %: 47.7
Density @ 15° C., g/cu m: 0.966
Sulfur, wt %: 3.60
Kin. vis., cSt @ 100° C.: 38.5

Short residuum
Range, °C.: 525+
Yield, wt %: 22.6
Density @ 15 °C., g/cu m: 1.020
Sulfur, wt %: 4.70
Kin. vis., cSt @ 100 °C.: 760
Con. carbon, wt %: 18.5
V/Ni, ppm: 80/22

Basrah Medium, Iraq

Mina-al-Bakr sea terminal in Persian Gulf (Khor al Khafja)

Crude
Gravity, °API: 31.1
Sulfur, wt %: 2.58
Pour pt, °C.: −30
Kin. vis., cSt @ 10° C.: 41.0
C_4 & lighter, wt %: 1.6

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 3.3
Density, 15° C., g/cu m: 0.64
RON + 0.4, g Pb/l: 80

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 14.9
Density @ 15° C., g/cu m: 0.736
RON + 0.4 g Pb/l: 54
Aromatics, vol %: 10.0
Naphthenes, vol %: 17

Kerosine
Range, °C.: 175-225
Yield, wt %: 7.5
Density @ 15° C., g/cu m: 0.793
Sulfur, wt %: 0.23

Gas oil
Range, °C.: 225-360
Yield, wt %: 22.3
Density @ 15° C., g/cu m: 0.849
Sulfur, wt %: 1.57
Pour pt, °C.: −13
CFPP, °C.: −10
Kin. vis., cSt @ 100° C.: 1.44

Heavy gas oil
Range, °C.: 360-520
Yield, wt %: 21.9
Density @ 15° C., g/cu m: 0.931
Sulfur, wt %: 3.08
Kin. vis., cSt @ 100 ° C.: 8.74

Long residuum
Range, °C.: 360+
Yield, wt %: 50.4
Density @ 15° C., g/cu m: 0.984
Sulfur, wt %: 4.38
Kin. vis., cSt @ 100° C.: 61.7

Short residuum
Range, °C.: 520+
Yield, wt %: 28.5
Density @ 15° C., g/cu m: 1.032
Sulfur, wt %: 5.43
Kin. vis., cSt @ 100° C.: 1,400
Con. carbon, wt %: 19.0
V/Ni, ppm: 175/63
Pen. @ 25° C., 0.1 mm: 180

Belayim, Egypt

Wadi el Feiran, Gulf of Suez

Crude
Gravity, °API: 27.5
Sulfur, wt %: 2.20
Vis., cSt @ 20° C.: 51.27
Pour pt, °C.: +6
Wax content, wt %: 8.0
Rvp, psi: 6.50
Carbon residue, wt %: 7.25
V/Ni, ppm: 79.4/54.6
C_1-C_4, yield, vol %: 2.43

Naphtha
Range, °C.: C_5-82
Yield, vol %: 5.12
RON, clear: 67.0
Ron + 0.4 Pb/l: 80.8

Naphtha
Range, °C.: 82-160
Yield, vol %: 10.15
Paraffins, vol %: 57.0
Napthenes, vol %: 33.0
Aromatics, vol %: 10.0
RON, clear: 47.2

Kerosine
Range, °C.: 160-230
Yield, vol %: 9.36
Gravity, °API: 45.4
Total sulfur, wt %: 0.36
Smoke pt, mm: 24
Aromatics, vol %: 16.7

Gas oil
Range, °C.: 230-350
Yield, vol %: 18.49
Gravity, °API: 34.0
Total sulfur, wt %: 1.47
Vis., cSt @ 20° C.: 6.532
Pour pt, °C: −7
Aniline pt, °C.: 69.2
Diesel index: 53.2

Vacuum distillate
Range, °C.: 350-550
Yield, vol %: 26.94
Gravity, °API: 23.2
Total sulfur, wt %: 2.19
Vis., cSt @ 50° C.: 36.24
Pour pt, °C.: +39
Carbon residue, wt %: 0.65
Basic N, ppm: 540
Total N, ppm: 1,813

Residue
Range, °C.: 350+
Yield, vol %: 54.45
Gravity, °API: 13.5
Total sulfur, wt %: 3.12
Vis., cSt @ 50° C.: 1,508
Pour pt, °C.: +30
Wax content, wt %: 13.7
Carbon residue, wt %: 12.10
V/Ni, ppm: 133.1/91.5

Burgan (Wafra), Divided Zone

Mina Saud, Divided Zone CBM, also Mina Abdulla, Kuwait

Crude
Gravity, °API: 23.3
Sulfur, wt %: 3.37
Pour pt, °F.: −5
Vis., Saybolt @ 122° F.: 134
Con. carbon, wt %: 7.7
Rvp, psi: 3.4
Salt content, lb/1,000 bbl: 17.5
V/Ni, ppm: 34/6.8

Light naphtha
Range, °F.: IBP-200
Yield, vol %: 3.20
Gravity, °API: 77.5
Sulfur, wt %: 0.01
Rvp, psi: 9.6
Paraffins, vol %: 74
Naphthenes, vol %: 25
Aromatics, vol %: 1
RON, clear: 73.1

Heavy naphtha
Range, °F.: 200-435
Yield, vol %: 13.62
Gravity, °API: 49.8
Sulfur, wt %: 0.15
Rvp, psi: 0.2
P/N/A, vol %: 44/36/20
RON, clear: 52.0
RON, + 3 g TEL: 68.0

Kerosine
Range, °F.: 435-500
Yield, vol %: 6.70
Gravity, °API: 38.5
Sulfur, wt %: 0.76
Aromatics, vol %: 37
Freezing pt, °F.: −47
Smoke pt, mm: 18
Aniline pt, °F.: 137.7
Cetane index: 47.3
ASTM, 50% pt, °F.: 456

Gas oil
Range, °F.: 500-620
Yield, vol %: 12.63
Gravity, °API: 32.7
Sulfur, wt %: 1.76
Pour pt, °F.: −5
Aniline pt, °F.: 153.3
Cetane index: 52.0

Residual oil
Range, °F.: 620+
Yield, vol %: 63.45
Gravity, °API: 13.2
Sulfur, wt %: 4.45
Pour pt, °F.: +60
Con. carbon, wt %: 1.5

Residual oil
Range, °F.: 1,048+
Yield, vol %: 34.23
Gravity, °API: 6.2
Sulfur, wt %: 5.43
Con. carbon, wt %: 20.3
V/Ni, ppm: 120/25

Dorrood (Darius), Iran

Kharg Island

Crude
Gravity, °API: 33.6
Sulfur, wt %: 2.35
Rvp, psi: 6.5
H_2S (evolved), wt %: 0.026
Pour pt, °F.: −4.5
Rams. carbon, wt %: 4.6
Kin. vis., cSt @ 100° F.: 5.65
V/Ni, ppm: 23/8
C_1-C_5, vol %: 6.35

Naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 10.1
Gravity, °API: 81.9
Sulfur, wt %: 0.067
Charac. factor: 12.70
Paraffins, vol %: 85.6
Naphthenes, vol %: 12.2
Aromatics, vol %: 2.2
RON/MON, clear: 61.7/61.1

Naphtha
Range (TBP), °F.: 200-320
Yield, vol %: 12.7
Gravity, °API: 59.0
Sulfur, wt %: 0.088
Charac. factor: 12.07
P/N/A, vol %: 67.5/17.8/14.8
RON/MON, clear: 33.0/ 35.9

Kerosine
Range, °F.: 320-520
Yield, vol %: 18.6
Gravity, °API: 44.9
Sulfur, wt %: 0.462
Charac. factor: 11.88
Aniline pt, °F.: 142.9
Diesel index: 64.1
Cetane index: 46.3
Freeze pt, °F.: −41
Cloud pt, °F.: −44
Pour pt, °F.: −49
Smoke pt, mm: 24
Naphthalenes, vol %: 2.66
Neut. no., mg Kctt/g: 0.20
Vis., SUS @ 68° F.: 32.7

Gas oil
Range, °F.: 520-650
Yield, vol %: 11.5
Gravity, °API: 33.7
Sulfur, wt %: 1.68
Charac. factor: 11.76
Aniline pt, °F.: 162.3
Diesel index: 54.6
Cetane index: 49.9
Cloud pt, °F.: 26
Pour pt, °F.: 21
Vis., SUS @ 68° F.: 47.0

Residuum
Range, °F.: 650+
Yield, vol %: 44.6
Gravity, °API: 14.5
Sulfur, wt %: 3.97
Pour pt: °F.: 58
Rams. carbon, wt %: 9.10
Vis., SUS @ 122° F.: 1,494.0
V/Ni, ppm: 45/16

Residuum
Range, °F.: 1,050+
Yield, vol %: 17.9
Gravity, °API: 3.8
Sulfur, wt %: 5.38
Pour pt, °F.: 141
V/Ni, ppm: 101/36

Dubai (Fateh), Dubai, U.A.E.

SBMs in offshore Persian Gulf producing area

Crude
Gravity, °API: 31.05
Total sulfur, wt %: 2.0
Kin. vis., cSt @ 20° C.: 12.82
@ 40° C.: 7.05
Rvp, bar: 0.419
Pour pt, °C.: −9
Asphaltenes, wt %: 1.70
Con. carbon, wt %: 4.62
V/Ni, ppm: 42/14

Debutanized naphtha
Range, °C.: 15-145
Yield, vol %: 16.4
Gravity °API: 75.0
Vol % position in crude: 2.0-18.4
Total sulfur, ppm: 193
Rvp, bar: 0.44
Paraffins, vol %: 68.4
Naphthenes, vol %: 23.1
Aromatics, vol %: 8.5
RON, clear: 55.6

Kerosine
Range, °C.: 145-230
Yield, vol %: 15.0
Total sulfur, wt %: 0.25
P/N/A, vol %: 50.9/29.9/19.2
Smoke pt, mm: 22
Aniline pt, °C.: 56.0
Diesel index: 62.1
Cetane index: 56.0

Gas oil
Range, °C.: 145-350
Yield, vol %: 36.6
Gravity, °API: 38.6
Total sulfur, wt %: 1.04
Kin. vis., cSt @ 20° C.: 3.02
@ 40° C.: 1.99
Aniline pt, °C.: 60.8
Diesel index: 54.6
Cetane index: 51.0

Gas oil
Range, °C.: 175-400
Yield, vol %: 39.9
Gravity, °API: 34.1
Total sulfur, wt %: 1.43
UOP factor: 11.65

Residue
Range, °C.: 350+
Yield, vol %: 45.0
Gravity, °API: 14.75
Total sulfur, wt %: 3.0
Kin. vis., cSt @ 50° C.: 351
@ 100° C.: 31.0
Pour pt, °C.: +19
Con. carbon, wt %: 9.1
V/Ni, ppm: 85/27

Dukhan (Qatar Land), Qatar

Umm Said terminal CBM & SBM

Crude
Gravity, °API: 41.7
Sulfur, wt %: 1.28
H_2S g/100 cc: 0.0283
Pour pt, °F.: −20
Rvp, psi: 11.7
Vis., SSU @ 80° F.: 43.3

Gasoline
Range, °F.: 40-155
Yield, vol %: 8.61
Gravity, °API: 86.5
Sulfur, wt %: 0.02
Paraffins, vol %: 95.0
Naphthenes, vol %: 3.9
Aromatics, vol %: 1.1

Light naphtha
Range, °F.: 155-265
Yield, vol %: 11.74
Gravity, °API: 64.3
Sulfur, wt %: 0.02
P/N/A, vol %: 67.8/19.7/12.5

Heavy naphtha
Range, °F.: 265-350
Yield, vol %: 10.65
Gravity, °API: 52.5
Sulfur, wt %: 0.03

P/N/A, vol %: 64.3/13.9/21.1
Dinaphthenes, vol %: 0.7
Smoke pt, calculated: 22.6

Kerosine
Range, °F.: 350-500
Yield, vol %: 15.83
Gravity, °API: 45.0
Cetane index (calculated): 51.1
Sulfur, wt %: 0.14
Aromatics, vol %: 21.1
Smoke pt: 21.0
Freeze pt, °F.: −42
Pour pt, °F.: −45

Heavy gas oil
Range, °F.: 500-650
Yield, vol %: 15.14
Cetane index (calculated): 55.1
Sulfur, wt %: 1.11
Total N, ppm: 35
Chloride, ppm: < 5.0
Pour pt, °F.: 15

Residue
Range, °F.: 650+
Yield, vol %: 32.66
Gravity, °API: 20.3
Sulfur, wt %: 2.58
Vis., SSU @ 210° F.: 73.2

Residue
Range, °F.: 650-1,000
Yield, vol %: 22.79
Gravity, °API: 24.1
Sulfur, wt %: 2.15
Total N, ppm: 525
Rams. carbon, wt %: 0.23
Vis., SSU @ 210° F.: 46.0

Pitch
Range, °F.: 1,000+
Yield, vol %: 9.87
Sulfur, wt %: 3.45
Con. carbon, wt %: 12.75
V/Ni, ppm: 19/3

Eocene (Wafra), Divided Zone

Mina Saud, Divided Zone CBM, also Mina Abdulla, Kuwait

Crude
Gravity, °API: 18.6
Sulfur, wt %: 4.55
Pour pt, °F.: −20
Vis., Saybolt 122° F.: 80.4
Con. carbon, wt %: 8.9
Rvp, psi: 1.1
Salt content, lb/1,000 bbl: 7.0

Light naphtha
Range, °F.: Ibp-200
Yield, vol %: 1.50
Gravity, °API: 77.6
Sulfur, wt %: 0.12
Rvp, psi: 11.4
Paraffins, vol %: 70
Naphthenes, vol %: 29
Aromatics, vol %: 1
RON, clear: 78.0
ASTM, 50% pt, °F.: 154

Heavy naphtha
Range, °F.: 200-435
Yield, vol %: 11.82
Gravity, °API: 51.0
Sulfur, wt %: 0.27
Rvp, psi: 1.4
P/N/A, vol %: 45/40/15
RON, clear: 48
RON, 3 g TEL: 60
ASTM, 50% pt, °F.: 325

Kerosine
Range, °F.: 435-500
Yield, vol %: 5.97
Gravity, °API: 36.9
Sulfur, wt %: 1.0
Aromatics, vol %: 30
Freezing pt, °F.: −66
Smoke pt, mm: 17
Aniline pt, °F.: 133.2
Cetane index: 43
ASTM, 50% pt, °F.: 458

Gas oil
Range, °F.: 500-620
Yield, vol %: 11.15
Gravity, °API: 31.0
Sulfur, wt %: 1.80
Pour pt, °F.: −30
Aniline pt, °F.: 145.8
Cetane index: 47
ASTM, 50% pt, °F.: 562

Residual oil
Range, °F.: 620+
Yield, vol %: 68.03
Gravity, °API: 10.0
Sulfur, wt %: 4.9
Pour pt, °F.: 60
Con. carbon, wt %: 14.83

Residual oil
Range, °F.: 1,044+
Yield, vol %: 39.75
Gravity, °API: 4.6
Sulfur, wt %: 6.1
Con. carbon, wt %: 22.5
V/Ni, ppm: 135/67

Foroozan (Fereidoon), Iran

Kharg Island

Crude
Gravity, °API: 31.3
Sulfur, wt %: 2.50
Rvp, psi: 5.7
H_2S (evolved), wt %: 0.015
Pour pt, °F.: −35
Neut. no., mg KOH/g: 0.70
Rams. carbon, wt %: 5.4
Kin. vis., cSt @ 68°F.: 15.33
V/Ni, ppm: 36/11
C_1-C_5, vol %: 6.35

Naphtha
Range, °F.: C_5-200
Yield, vol %: 9.9
Gravity, °API: 82.6
Sulfur, wt %: 0.017
Charac. factor: 12.72
Paraffins, vol %: 76.8
Naphthenes, vol %: 21.8
Aromatics, vol %: 1.4
RON/MON, clear: 64.3/62.6

Naphtha
Range, °F.: 200-320
Yield, vol %: 10.5
Gravity, API: 58.1
Sulfur, wt %: 0.056
Charac. factor: 12.02
P/N/A, vol %: 71.6/17.2/11.3
RON/MON, clear: 30.2/32.0

Kerosine
Range, °F.: 320-520
Yield, vol %: 17.7
Gravity, °API: 44.3
Sulfur, wt %: 0.435
Charac. factor: 11.84
Aniline pt, °F.: 145.2
Diesel index, °F.: 64.3
Cetane index: 45.4
Freeze pt, °F.: −41
Cloud pt, °F.: −52
Pour pt, °F.: −52
Smoke pt, mm: 22
Vis., SUS @ 68° F.: 32.4

Gas oil
Range, °F.: 520-650
Yield, vol %: 10.8
Gravity, °API: 33.4
Sulfur, wt %: 1.56
Charac. factor: 11.74
Aniline pt, °F.: 161.2
Diesel index: 53.8
Cetane index: 49.4
Cloud pt, °F.: 20
Pour pt, °F.: 19
Vis., SUS @ 68° F.: 48.0

Residuum
Range, °F.: 650+
Yield, vol %: 48.8
Gravity, °API: 13.6
Sulfur, wt %: 4.13
Pour pt, °F.: 34
Rams. carbon, wt %: 9.86
Vis., SUS @ 122 °F.: 3,616.0
V/Ni, ppm: 66/20

Residuum
Range, °F.: 1,050+
Yield, vol %: 20.4
Gravity, °API: 3.8
Sulfur, wt %: 5.6
Pour pt, °F.: 158
V/Ni, ppm: 143/44

Gulf of Suez Mix, Egypt

Ras Shukheir/3 conventional sea berths

Crude
Gravity, °API: 31.9
Sulfur, wt %: 1.52
Rvp, psi: 8.3
Pour pt, °F.: 35
Rams. carbon, wt %: 4.4
Kin. vis., cSt @ 100° F.: 8.74
V/Ni, ppm: 41/25
C_1-C_5, vol % yield: 5.48

Naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 7.8
Gravity, °API: 79.1
Total sulfur, wt %: 0.018
Rvp, psi: 10.7
Paraffins, vol %: 80.0
Naphthenes, vol %: 18.0
Aromatics, vol %: 2.0
RON, clear: 69.4
MON, clear: 66.1

Naphtha
Range (TBP), °F.: 200-320
Yield, vol %: 10.0
Gravity, °API: 56.7
Total sulfur, wt %: 0.022
Rvp, psi: 1.1
P/N/A, vol %: 57.3/32.7/10.1
RON, clear: 47.2
MON, clear: 43.9

Kerosine
Range (TBP), °F.: 320-520
Yield, vol %: 17.7
Gravity, °API: 42.6
Total sulfur, wt %: 0.395
Aniline pt, °F.: 138.6
Diesel index: 59.1
Cetane index: 43.0
Freeze pt, °F.: −48
Cloud pt, °F.: −42
Smoke pt, mm: 26
Naphthalenes, vol %: 2.88

Gas oil
Range (TBP), °F.: 520-650
Yield, vol %: 11.3
Gravity, °API: 33.9
Total sulfur, wt %: 1.2
Aniline pt, °F.: 159.1
Diesel index: 53.9
Cetane index: 50.21
Cloud pt, °F.: 26
Vis., SUS @ 68° F.: 49.8

Gas oil
Range (TBP), °F.: 650-850
Yield, vol %: 17.2
Gravity, °API: 27.2
Total sulfur, wt%: 1.6
Rams. carbon, wt %: 0.34

Residuum
Range, °F.: 650+
Yield, vol %: 50.8
Gravity, °API: 17.2
Total sulfur, wt %: 2.365
Rams. carbon, wt %: 7.90
Vis., SUS @ 122° F.: 1,146.9
V/Ni, ppm: 73/46

Hout, Divided Zone

Sea berth off Ras Al Khafji

Crude
Gravity, °API: 32.8
Sulfur, wt %: 1.91
Rvp, psi: 4.6
Pour pt, °F.: −13.0
Kin. vis., cSt @ 86° F.: 9.88
Con. carbon, wt %: 5.01
Asphaltenes, wt %: 1.65
Wax content, wt %: 3.2
Neut. no., mg KOH/g: 0.04
C_1-C_4, vol %: 1.8
V/Ni, ppm: 28/6

Light naphtha
Range (TBP), °F.: C_5-176
Yield, vol %: 6.3
Gravity, °API @ 60° F.: 83.7
Sulfur, wt %: 0.029
H_2S, ppm: 19
Rvp, psi: 10.3
RON, clear: 64.6
RON + 3.0 ml TEL/gal: 84.2
MON, clear: 61.0
Paraffins, vol %: 92.6
Naphthenes, vol %: 6.4
Aromatics, vol %: 1.0

Full range naphtha
Range (TBP), °F.: C_5-374
Yield, vol %: 24.5
Gravity, °API: 63.5
Sulfur, wt %: 0.035
H_2S, ppm: 26
Rvp, psi: 4.3
RON, clear: 44.0
MON, clear: 43.6
Aniline pt, °F.: 134
P/N/A, vol %: 70.8/15.6/13.6

Kerosine
Range, °F.: 374-482
Yield, vol %: 11.3
Gravity, API @ 60° F.: 445
Sulfur, wt %: 0.204
Pour pt, °F.: −49
Cloud pt, °F.: −49
Freeze pt, °F.: −42
Smoke pt, mm: 23.5
Aniline pt, °F.: 147
Saturates, vol %: 81.5
Aromatics, vol %: 18.0
Olefins, vol %: 0.5

Gas oil
Range, °F.: 482-644
Yield, vol %: 15.0
Gravity, °API @ 60° F.: 36.0
Sulfur, wt %: 1.07
Kin. vis. @ 100 °F.: 3.954
Pour pt, °F.: 14
Aniline pt, °F.: 163
Cetane index: 56.5

Residue
Range, °F.: 644+
Yield, vol %: 47.4
Gravity, °API @ 60° F.: 16.4
Sulfur, wt %: 3.39
Kin. vis., cSt @ 122° F.: 360.3
Pour pt, °F.: 68
Con. carbon, wt %: 10.3
V/Ni, ppm: 58/13

Residue
Range, °F.: 1,022+
Yield, vol %: 21.8
Gravity, °API @ 60° F.: 7.9
Sulfur, wt %: 4.39
Kin. vis., cSt @ 210° F.: 118.6
Pour pt, °F.: 91
Con. carbon, wt %: 20.7
Asphaltenes, wt %: 6.42
V/Ni, ppm: 110/31

Iranian Heavy, Iran

Kharg Island

Crude
Gravity, °API: 31.0
Total sulfur, wt %: 1.65
Vis., cSt @ 70° F.: 16.84
Vis., cSt @ 100° F.: 9.36
Pour pt, °F.: −5
C_1-C_4 yield, vol %: 2.38

Gasoline
Range (TBP), °C.: C_5-65
Yield, vol %: 3.49
Sp. gr. 60/60 °F.: 0.6468
RON, clear: 73.0
Paraffins, wt %: 93.5
Naphthenes, wt %: 5.7
Aromatics, wt %: 0.8

Light naphtha
Range, °C.: 65-149
Yield, vol %: 14.53
Sp. gr., 60/60 °F.: 0.7392
Total sulfur, wt %: 0.088
P/N/A, wt %: 53.4/33.1/13.5

Heavy naphtha
Range, °C.: 149-262
Yield, vol %: 18.26
Sp. gr., 60/60 °F.: 0.8041
Total sulfur: 0.289
Freezing pt, °C.: −50.0
Aromatics, vol %: 17.8
Aniline pt, °C.: 59.1
Smoke pt, mm: 23

Gas oil
Range, °C.: 262-352
Yield, vol %: 14.60
Total sulfur, wt %: 1.22
Cloud pt, °F.: 28
Pour pt, °F.: 24
Diesel index: 52

Residue
Range, °C.: 352+
Yield, vol %: 46.74
Total sulfur, wt %: 2.55
Vis., cSt @ 122° F.: 614
Vis, cSt @ 210° F.: 49.8
Con. carbon, wt %: 9.9
Asphaltenes, wt %: 3.8
V/Ni, ppm: 139/58

Assay sample taken at production rate of 1.84 million b/d with following field contributions in b/d:

Ahwaz—700,000
Gachsaran—628,000
Bibi Hakimeh—269,000
Kharg, Kupal, Monsuri and Rag E. Safid—251,000

Iranian Light, Iran

Kharg Island

Crude
Gravity, °API: 33.8
Pour pt, °F.: −20
Total sulfur, wt %: 1.35
Vis., cSt @ 70° F.: 10.58
@ 130° F.: 4.22

Gasoline
Range, °C.: C_5-65
Yield, vol %: 3.86
Sp. gr. 60/60° F.: 0.6465
RON clear: 72.4
Paraffins, wt %: 94.4
Naphthenes, wt %: 4.8
Aromatics, wt %: 0.8

Light naphtha
Range, °C.: 65-149
Yield, vol %: 14.17
Sp. gr. 60/60° F.: 0.7387
Total sulfur, wt %: 0.040
P/N/A, wt %: 57.5/31.1/11.4

Heavy naphtha
Range, °C.: 149-262
Yield, vol %: 20.45
Sp. gr., 60/60° F.: 0.8028
Total sulfur, wt %: 0.198
Freezing pt, °C.: −—49
Aromatics, vol %: 18.0
Aniline pt, °C: 60.3
Smoke pt, mm: 24

Gas oil
Range, °C.: 262-352
Yield, vol %: 15.32
Sp. gr. 60/60° F.: 0.8599
Total sulfur, wt %: 1.05
Cloud pt, °F.: 28
Pour pt, °F.: 24
Diesel index: 53

Residue
Range, °C.: 352+
Yield, vol %: 43.3
Sp. gr. 60/60° F.: 0.9531
Total sulfur, wt %: 2.42
Vis., cSt @ 122° F.: 297.0
@ 210° F.: 29.8
Con. carbon, wt %: 9.0
Asphaltenes, wt %: 1.2
V/Ni, ppm: 70/32

Assay sample taken at production rate of 2.6 million b/d with following field contributions in b/d:

Agha Jari—870,000
Marun—1.03 million
Karanj—356,000
Paris—279,000
Pazanan—33,000

Khafji, Divided Zone

Sea berth off Ras Al Khafji

Crude
Gravity, °API: 28.5
Sulfur, wt %: 2.85

H_2S (dissolved), ppm: <1
Rvp, psi: 7.6
Pour pt, °F.: −31
Kin. vis., cSt @ 86° F.: 21.3
Con. carbon residue, wt %: 8.04
Asphaltenes, wt %: 4.32
Wax content, wt %: 2.7
Neut. no., mg KOH/g: 0.18
C_1-C_4, vol %: 3.41
V/Ni, ppm: 55/16

Light naphtha
Range (TBP), °F.: C_5-176
Yield, vol %: 5.5
Gravity, °API @ 60°F.: 85.2
Sulfur, wt %: 0.0028
Rvp, psi: 10.8
RON, clear: 66.2
RON + 1.0 ml TEL/gal: 78.5
MON, clear: 63.4
Paraffins, vol %: 93.9
Naphthenes, vol %: 5.4
Aromatics, vol %: 0.7

Full range naphtha
Range (TBP), °F.: C_5-374
Yield, vol %: 20.4
Gravity, °API @ 60° F.: 65.0
Sulfur, wt %: 0.0264
Rvp, psi: 4.3
RON, clear: 41.0
RON + 1 ml TEL/gal: 53.1
MON, clear: 41.2
Aniline pt, °F.: 139
P/N/A, vol %: 73.4/15.4/11.2

Kerosine
Range (TBP), °F.: 374-482
Yield, vol %: 9.5
Gravity, °API @ 60° F.: 44.5
Sulfur, wt %: 0.324
Cloud pt, °F.: −45
Freeze pt, °F.: −45
Smoke pt, mm: 23.7
Aniline pt, °F.: 145
Saturates, vol %: 80.5
Aromatics, vol %: 19.0
Olefins, vol %: 0.5

Gas oil
Range (TBP), °F.: 482-644
Yield, vol %: 13.9
Sulfur, wt %: 1.42
Kin. vis. @ 100° F.: 3.9
Pour pt, °F.: 10
Cloud pt, °F.: 10
Aniline pt, °F.: 156
Cetane index: 54.2

Residue
Range (TBP), °F.: 644+
Yield, vol %: 52.8
Gravity, °API @ 60° F.: 12.1
Sulfur, wt %: 4.46
Kin. vis., cSt @ 122° F.: 1,795
Pour pt, °F.: 50
Con. carbon, wt %: 13.4
Asphaltenes, wt %: 7.84
V/Ni, ppm: 95/28

Residue
Range (TBP), °F.: 991+
Yield, vol %: 27.8
Gravity, °API @ 60° F.: 4.5
Sulfur, wt %: 5.65
Kin. vis., cSt @ 210° F.: 6,043
Pour pt, °F.: 145
Con. carbon, wt %: 24.4
Asphaltenes, wt %: 15.4
V/Ni, ppm: 170/49

Kirkuk Blend, Iraq

Mina-al-Bakr sea terminal in Persian Gulf also Ceyhan (Dortyol), Turkey

Crude
Gravity, °API: 35.1
Sulfur, wt %: 1.97
Pour pt, °C.: −22
Kin. vis., cSt @ 10° C.: 12.8
C_4 & lighter, wt %: 1.8

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 4.1
Density @ 15° C., g/cu m: 0.644
RON + 0.4 g Pb/l: 81

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 18.1
Density @ 15° C., g/cu m: 0.740
RON + 0.4 g Pb/l: 58.5
Aromatics, vol %: 10.5
Naphthenes, vol %: 22

Kerosine
Range, °C.: 175-225
Yield, wt %: 8.7
Density @ 15° C., g/cu m: 0.794
Sulfur, wt %: 0.19

Gas oil
Range, °C.: 225-360
Yield, wt %: 24.0
Density @ 15° C., g/cu m: 0.843
Sulfur, wt %: 1.18
Pour pt, °C.: −12
Cold filter pour pt, °C.: −9
Kin. vis., cSt @ 100° C.: 1.34

Heavy gas oil
Range, °C.: 360-525
Yield, wt %: 22.9
Density @ 15° C., g/cu m: 0.917
Sulfur, wt %: 2.35
Kin. vis., cSt @ 100° C.: 7.98

Long residuum
Range, °C.: 360+
Yield, wt %: 43.3
Density @ 15° C., g/cu m: 0.968
Sulfur, wt %: 3.76
Kin. vis., cSt @ 100° C.: 42.9

Short residuum
Range, °C.: 525+
Yield, wt %: 20.4
Density @ 15° C., g/cu m: 1.003
Sulfur, wt %: 5.30
Kin. vis., cSt @ 100° C.: 1,550
Con. carbon, wt %: 21.0
V/Ni, ppm: 142/54

Kuwait Export, Kuwait

Mina al Ahmadi

Crude
Gravity, °API: 31.4
Vis., SUV, sec @ 100° F.: 58.1
Pour pt, °F.: +5
Sulfur, wt %: 2.52
Ni/V (calc.), ppm: 8/30
Rvp, psi: 6.7
H_2S, wt %: <0.001
C_1-C_4 (GC analysis), vol %: 3.03

Naphtha
Range, °F.: Over point — 140
Yield, vol %: 3.80
Gravity, °API: 89.7
Sulfur, wt %: 0.04
RON (micro), clear: 71.8
RON + 3 ml TEL: 89.3

Naphtha
Range, °F.: 140-170
Yield, vol %: 2.26
Gravity, °API: 78.6
Sulfur, wt %: 0.02
Aniline pt, °F.: 147.7
RON, clear/+ 3 ml TEL: 58.2/80.40
Paraffins, vol %: 88.5
Monocycloparaffins, vol %: 9.9
Aromatics, total, vol %: 1.6

Heavy naphtha
Range, °F.: 170-310
Yield, vol %: 11.91
Gravity, °API: 62.1
Sulfur, wt %: 0.03
Aniline pt, °F.: 136.2
Paraffins, vol %: 70.1
Monocycloparaffins, vol %: 20.4
Dicycloparaffins, vol %: 0.4
Aromatics, total, vol %: 9.1

Kerosine
Range, °F.: 310-520
Yield, vol %: 18.43
Gravity, °API: 45.9
Pour pt, °F.: −45
Sulfur, wt %: 0.39
Aniline pt, °F.: 142.9
Cetane index: 53.8
Smoke pt, mm: 26

Heating oil
Range, °F.: 520-680
Yield, vol %: 14.89
Gravity, °API: 32.9
Vis., SUV, sec. @ 100° F.: 43.3
Pour pt, °F.: +20
Total N, ppm: 100
Sulfur, wt %: 1.98
Aniline pt, °F.: 160.2
Cetane index: 54.3

Gas oil
Range, °F.: 680-1,000
Yield, vol %: 24.09
Gravity, °API: 21.4
Pour pt, °F.: +100
Sulfur, wt %: 3.12
Total N, ppm: 900
Ni/V, ppm: <0.1/<0.1
Vis., SUV, sec @ 130° F.: 175.2
Rams. carbon residue, wt %: 0.47

Residuum
Range (VEFV), °F.: 1,000+
Yield, vol %: 21.78
Gravity, °API: 5.8
Sulfur, wt %: 5.11
V/Ni, ppm: 116/34
Vis., SUV, sec @ 250° F.: 3,394
Rams. carbon residue, wt %: 21.9

Mubarek, Sharjah, U.A.E.

Floating storage and loading facility in offshore producing area

Crude
Gravity, °API: 37
Sulfur, wt %: 0.62
Rvp, psi: 4.8
Pour pt, °F.: 10
Salt, lb/1,000 bbl: 23
Vis., cSt @ 100° F.: 3.20
@ 122° F.: 2.80
Gas, vol % of crude: 0.7

Light straight run
Range, °F.: ibp-220
Yield, vol %: 12.7
Octane, F-1 clear: 68.2
Gravity, °API: 72.2
Rvp, psi: 11.8
Sulfur, wt %: 0.01

Light naphtha
Range, °F.: 220-300
Yield, vol %: 9.1
Paraffins, vol %: 51.6
Naphthenes, vol %: 30.4
Aromatics, vol %: 18.0
Octane, F-1 clear: 50.5
Gravity, °API: 55.2
Sulfur, wt %: 0.01

Heavy naphtha
Range, °F.: 300-360
Yield, vol %: 7.2
P/N/A, vol %: 48.5/28.8/22.7
Gravity, °API: 49.9
Sulfur, wt %: 0.01

Kerosine
Range, °F.: 360-500
Yield, vol %: 17.6
Gravity, °API: 42.7
Smoke pt, mm: 25
Aniline pt, °F.: 134
Diesel index: 57.2
Pour pt, °F.: −55
Sulfur, wt %: 0.04
Vis., cSt @ 100° F.: 1.40

Light gas oil
Range, °F.: 500-700
Yield, vol %: 21.4
Gravity, °API: 32.6
Aniline pt, °F.: 156
Diesel index: 50.9
Pour pt, °F.: 20
Rams. carbon residue, wt %: 0.66
Sulfur, wt %: 0.66
Vis., cSt @ 100° F.: 4.55
@ 210° F.: 1.54
Bromine no.: 0.6

Residuum
Range, °F.: 700+
Yield, vol %: 30.8
Gravity, °API: 19.6
Rams. carbon residue, wt %: 4.74
Sulfur, wt %: 1.18

Residuum
Range, °F.: 1,000+
Yield, vol %: 9.2
Gravity, °API: 12.2
Rams. carbon residue, wt %: 15.09
Sulfur, wt %: 1.43
V/Ni, ppm: 11.40/6.0

Murban, Abu Dhabi

Port of Jebel Dhanna/4 CBM berths

Crude
Gravity, °API: 40.45
Rvp @ 37.8° C., psia: 3.46
Pour pt, °C.: −24
Kin. vis., cSt @ 40° C.: 2.70
Sulfur, wt %: 0.78
V/Ni, ppm: <0.1/0.7
Con. carbon, wt %: 1.35
Charac. factor, K_{UOP}: 12.1

Naphtha
Range (TBP), °C.: 20-165
Yield, vol %: 27.4
Position on crude, vol %: 1.9-29.3
Gravity, °API: 63.47
Sulfur, ppm: 43
RON, clear: 50

Naphtha
Range (TBP), °C.: 20-180
Yield, vol %: 31.2
Position on crude, vol %: 1.9-33.1
Gravity, °API: 61.48
Sulfur, ppm: 64
RON, clear: 47

Kerosine
Range (TBP), °C.: 150-220
Yield, vol %: 16.6
Position on crude, vol %: 25.3-41.9
Gravity, °API: 18.22
Smoke pt, mm: 24
Freeze pt, °C.: −46
Aromatics, vol %: 21
Aniline pt, °C.: 55.2
Sulfur, wt %: 0.022

Diesel
Range (TBP), °C.: 220-350
Yield, vol %: 26.0
Gravity, °API: 37.37
Sulfur, wt %: 0.62
Cloud pt, °C.: −12
Pour pt, °C.: −12
Vis., cSt @ 100° C.: 1.25
Aniline pt, °C.: 72.3
Diesel index: 60.6
Cetane index: 60
Con. carbon on 10% residue, wt %: <0.01

Residuum
Range (TBP), °C.: 350+
Yield, vol %: 32.1
Gravity, °API: 22.72
Sulfur, wt %: 1.73
Vis., cSt @ 100° C.: 10.85
Con. carbon, wt %: 4.3
Asphaltenes, wt %: 0.15
Pour pt, °C.: +33
V/Ni, ppm: 0.4/2.0
Flash pt, °C.: 214
Nitrogen, wt %: 0.125

Residuum
Range (TBP), °C.: 540+
Yield, vol %: 9.3
Gravity, °API: 13.99
Sulfur, wt %: 2.20
Vis., cSt @ 50° C.: 3,340.
Con. carbon, wt %: 11.5
Asphaltenes, wt %: 0.74

Oman Export, Oman

Mina al Fahal

Crude
Gravity, °API: 36.3
Sulfur, wt %: 0.79
Pour pt, °F.: −15
Rvp, psi: 4.2
Vis., SUS @ 60° F.: 64.8
Yield, ibp to 113 °F., vol %: 3.63

Fraction yields (partial)
Range/vol %:
390-450/6.73
450-500/5.74
500-550/5.64
550-650/10.76

Straight run
Range, °F.: 113-220
Yield, vol %: 7.54
Gravity, °API: 70.4
RON + 3 cc Pb: 74.2
Sulfur, wt %: 0.0
Paraffins, vol %: 77.0
Naphthenes, vol %: 18.24
Aromatics, vol %: 4.8

Naphtha
Range, °F.: 220-390
Yield, vol %: 17.77
Gravity, °API: 55.3
Sulfur, wt %: 0.03
P/N/A, vol %: 67.6/21.3/10.1
Dinaphthenes, vol %: 1.0

Kerosine
Range, ° F.: 315-500
Yield, vol %: 20.56
Gravity, °API: 46.5
Sulfur wt %: 0.12
Aromatics, vol %: 12.9
Smoke pt, mm: 26
Freeze pt, °F.: −56
Pour pt, °F.: −70

Light gas oil
Range, °F.: 450-650
Yield, vol %: 22.14
Gravity, °API: 37.5
Cetane index: 57.0
Sulfur, wt %: 0.42
Total N, ppm: 31
Aniline pt, °F.: 168.3
Pour pt, °F.: −15

Heavy gas oil
Range, °F.: 650-1,000
Yield, vol %: 26.15
Gravity, °API: 26.8
Sulfur, wt %: 0.98
Total N, ppm: 516
Pour pt, °F.: 70
Carbon residue, wt %: 0.14

Flashed residue
Range, °F.: 1,000+
Yield, vol %: 16.03
Gravity, °API: 14.2
Sulfur, wt %: 1.96
Vis., SSF @ 210 °F.: 196.0

Qatar Marine, Qatar

Halul Island

Crude
Gravity, °API: 35.3
Sulfur, wt %: 1.57
Pour pt, °F.: 10
H_2S g/100 cc: 0.0315
Vis., SSU @ 60° F.: 53.4

Light straight run
Range, °F.: 40-155
Yield, vol %: 6.45
Gravity, °API: 82.5
Sulfur, wt %: 0.05
P/N/A, vol %: 88.7/9.5/1.7

Light naphtha
Range, °F.: 155-265
Yield, vol %: 9.45
Sulfur, wt %: 0.03
Paraffins, vol %: 60.6
Naphthenes, vol %: 23.3
Aromatics, vol %: 16.1

Heavy naphtha
Range, °F.: 265-350
Yield, vol %: 10.07
Gravity, °API: 51.8
Sulfur, wt %: 0.04
P/N/A: 56.7/18.5/22.9
Dinaphthenes, vol %: 1.9

Kerosine
Range, °F.: 350-500
Yield, vol %: 16.28
Gravity, °API: 43.1
Cetane index (calculated): 47.5
Sulfur, wt%: 0.18
Aromatics, vol %: 24.0
Smoke pt, mm: 19.0
Freeze pt, °F.: −44
Pour pt, °F.: −50

Heavy gas oil
Range, °F.: 500-650
Yield, vol %: 15.50
Cetane index (calculated): 51.6
Sulfur, wt %: 1.24
Total N, ppm: 72
Pour pt, °F.: 25

Residue
Range, °F.: 650+
Yield, vol %: 39.53
Gravity, °API: 16.5
Sulfur, wt %: 2.73
Vis., SUS @ 210° F.: 121.5

Residue
Range, °F.: 1,000+
Yield, vol %: 19.33
Gravity, °API: 10.3
Sulfur, wt %: 3.4
Con. carbon, wt %: 12.5
V/Ni, ppm: 31/7

Rostam, Iran

Lavan Island terminal

Crude
Gravity, °API: 35.9
Vis., cSt @ 50° C.: 3.08
Pour pt, °C.: −22.5
Sulfur, wt %: 1.55
NaCl, wt%: 0.036

Gasoline
Range, °F.: Ibp-165
Yield, vol %: 24.2
RON, clear: 61.4

Kerosine
Range, °C.: 165-220
Yield, vol %: 11.2

Gas oil
Range, °C.: 220-310
Yield, vol %: 17.3

Residuum
Yield, vol %: 45.8
Pour pt, °C.: +12.5
Sulfur, wt %: 2.82
Carbon, wt %: 6.25

Note: Same assay first published in 1976.

Salmon (Sassan), Iran*

Levan Island

Crude
Gravity, °F.: 33.9
Paraffin, wt%: 1.9
Sulfur, wt %: 1.91
Pour pt, °F.: −5
Vis., SUS @ 77° F.: 52.1
@100° F.: 44.2
Bs&w: 17,550

Straight-run gasoline
Range, vapor-cut points, °F.: 50-200
Yield, vol %: 10.5
Gravity, °API: 77.6
Sulfur, wt %: 0.081
Mercaptan sulfur: 0.067
Octane no., F-1 clear: 61.0

Naphtha
Range, VCP, °F.: 200-375
Yield, vol %: 16.4
Gravity, °API: 53.3
Sulfur, wt %: 0.0820
Mercaptan S, wt %: 0.002
Aniline pt, °F.: 121.5
Octane no., F-1 clear: 35.4
Arom. + naphthenes, vol %: 41

Kerosine
Range VCP, °F.: 375-450
Yield, vol %: 7.5
Gravity, °API: 45.1
Sulfur, wt %: 0.19
Freezing pt, °F.: −50
Aniline pt, °F.: 137.9
Smoke pt, mm: 20
Kin. vis., cSt @ 60° F.: 2.05
@ 100° F.: 30

Gas oil
Range VCP, °F.: 450-700
Yield, vol %: 23.8
Gravity, °API: 34.1
Sulfur, wt %: 1.2
Pour pt, °F.: +15
Aniline pt, °F.: 153.3
Kin. vis., cSt @ 60° F.: 7.52
@ 100° F.: 4.03
Cetane no.: 56.3

Residual oil
Range VCP, °F.: 700+
Yield, vol %: 39.7
Gravity, °API: 15.3
Sulfur, wt %: 3.5
Pour pt, °F.: +75
Vis., SUS @ 210° F.: 154
@ 275° F.: 67.8
V + Ni, ppm: 44

Residual oil
Range, VCP, °F.: 1,070+
Yield, vol %: 12.0
Gravity, °API: 1.3
Sulfur, wt %: 5.0
Vis., SUS @ 210° F.: 8,000
@ 275° F.: 1,000
V + Ni, ppm: 127

* New assay not available. This one first published in OGJ in 1976. Sassan is produced from same reservoir as Abu Al Bu Khoosh.

Sirri, Iran

Offshore terminal in Persian Gulf producing area

Crude
Gravity, °API: 30.9
Kin. vis., cSt @ 10° C.: 20.3
@ 37.8° C.: 7.36
Pour pt, °C.: −9
Total sulfur, wt %: 2.3
Rvp, bars: 0.650
Paraffins, wt %: 3.43
Asphaltenes, wt %: 1.48
V/Ni/Fe, ppm: 41/12/3
Yield C_1—C_5, vol %: 7.14

Light gasoline
Range, °C.: C_5-80
Yield, vol %: 5.19
RON, clear: 64.1
Total sulfur, wt %: 0.0080

Heavy gasoline
Range, °C.: 80-180
Yield, vol %: 15.28
Paraffins, vol %: 59.0
Naphthenes, vol %: 30.0
Aromatics, vol %: 11.0
Sulfur, wt %: 0.078

Kerosine
Range, °C.: 180-225
Yield, vol %: 7.54
Smoke pt, mm (150°-225° C.): 18.50
Sulfur, wt %: 0.436

Gas oil
Range, °C.: 180-350
Yield, vol %: 29.61
Pour pt, °C.: −21
Total sulfur, wt %: 1.42
Aniline pt, °C.: 62.2
Diesel index (calculated): 51.9

Residue
Range, °C.: 350+
Yield, vol %: 46.33
Pour pt, °C.: +21
Kin. vis., cSt @ 50° C.: 375
@ 70° C.: 120
Total sulfur, wt %: 3.65
Asphaltenes, wt %: 3.01
Con. carbon, wt %: 9.53
V/Ni/Fe, ppm: 70/20/4

Soroosh (Cyrus), Iran

Offshore terminal with SBM in production area

Crude
Gravity, °API: 18.1
Sulfur, wt %: 3.3
Rvp, psi: 0.3
H_2S (evolved), wt %: 0.007
Pour pt, °F.: 10
Neut. no., mg KOH/g: 0.50
Rams. carbon, wt %: 12.2
Kin. vis., cSt @ 68° F.: 1,381.4
V/Ni, ppm: 101/35
C_1-C_5, vol %: 1.32

Naphtha
Range, °F.: C_5-200
Yield, vol %: 3.3
Gravity, °API: 77.3
Sulfur, wt %: 0.008
Charac. factor: 12.49
Paraffins, vol %: 69.1
Naphthenes, vol %: 29.7
Aromatics, vol %: 1.1
RON/MON, clear: 73.5/70.6

Naphtha
Range, °F.: 200-320
Yield, vol %: 5.1
Gravity, °API: 57.8
Sulfur, wt %: 0.021
Charac. factor: 12.00
P/N/A, vol %: 49.0/42.2/8.8
RON/MON, clear: 49.9/50.5

Kerosine
Range, °F.: 320-520
Yield, vol %: 11.6
Gravity, °API: 42.5
Sulfur, wt %: 0.37
Charac. factor: 11.76
Aromatics, vol %: 15.7
Aniline pt, °F.: 140.8
Diesel index: 59.8
Cetane index: 44.6
Freeze pt, °F.: −46
Cloud pt, °F.: −41
Pour pt, °F.: −55
Smoke pt, mm: 25
Neut no., mg KOH/g: 0.10
Vis., SUS @ 68° F.: 32.6

Gas oil
Range, °F.: 520-650
Yield, vol %: 9.6
Gravity, °API: 33.0
Sulfur, wt %: 1.19
Charac. factor: 11.72
Aniline pt, °F.: 152.9
Diesel index: 50.5

Cetane index: 49.0
Cloud pt, °F.: 11
Pour pt, °F.: 6
Naphthalenes, vol %: 13.68
Vis., SUS @ 68 °F.: 47.9

Residuum
Range, °F.: 650°
Yield, vol %: 70.1
Gravity, °API: 9.2
Sulfur, wt %: 4.3
Pour pt, °F.: 99
Rams. carbon, wt %: 16.31
Vis., SUS @ 210° F.: 1,439.8
V/Ni, ppm: 135/47

Residuum
Range, °F.: 1,050 +
Yield, vol %: 36.5
Gravity, °API: −0.2
Sulfur, wt %: 5.6
Pour pt, °F.: 213
V/Ni, ppm: 237/82

Souedie, Syria

Tartus/CBMs

Crude
Gravity, °API: 24.9
Sulfur, wt %: 3.82
Pour pt, °C.: −30
Kin. vis. @ 10° C.: 88.3
C_4 & lighter: 0.8

Light SR naphtha
Range, °C.: C_5-65
Yield, wt %: 3.2
Density @ 15° C., g/cu cm: 0.647
RON + 0.4 g Pb/l: 79.5

Heavy SR naphtha
Range, °C.: 65-175
Yield, wt %: 13.1
Density @ 15° C., g/cu m: 0.734
RON + 0.4 g Pb/l: 58
Naphthenes, vol %: 18
Aromatics, vol %: 10.5

Kerosine
Range, °C.: 175-225
Yield, wt %: 6.0
Density @ 15° C., g/cu m: 0.798
Sulfur, wt %: 0.38

Gas oil
Range, °C.: 225-360
Yield, wt %: 19.7
Density @ 15° C., g/cu m: 0.865
Sulfur, wt %: 2.50
Pour pt, °C.: −14
CFPP, °C.: −11
Kin. vis., cSt @ 100° C.: 1.40

Heavy gas oil
Range, °C.: 360-425
Yield, wt %: 9.8
Density @ 15° C., g/cu m: 0.925
Sulfur, wt %: 3.90
Kin. vis., cSt @ 100° C.: 4.3

Long residuum
Range, °C.: 360 +
Yield, wt %: 57.2
Density @ 15° C., g/cu m: 1.015
Sulfur, wt %: 5.90
Kin. vis., cSt @ 100° C.: 330.0

Short residuum
Range, °C.: 425 +
Yield, wt %: 47.4
Density @ 15° C., g/cu m: 1.040
Sulfur, wt %: 6.0
Kin. vis., cSt @ 100° C.: 1,800
Con. carbon residue, wt %: 21.5
V/Ni, ppm: 185/60

Umm Shaif (Abu Dhabi Marine), Abu Dhabi

Das Island

Crude
Gravity, °API: 37.4
Sulfur, wt %: 1.51
Pour pt, °C.: −30
Rvp @ 37.8° C., psia: 7.05
H_2S, ppm: <2
Asphalt, wt %: 0.13

Light naphtha
Range (TBP), °C.: C_5-80
Yield, vol %: 8.2
Gravity, °API: 83.1
Charac. factor K: 12.73
Sulfur, ppm : 1,030
RON, clear: 65
RON + 1.5 ml/v . gal TEL: 74.5
MON, clear: 61

Heavy naphtha
Range (TBP), °C.: 80-150
Yield, vol %: 13.7
Gravity, °API: 59.26
Sulfur, wt %: 0.052

Kerosine
Range (TBP), °C.: 150-230
Yield, vol %: 15.8
Gravity, °API: 47.53
Freeze pt, °C.: −53.0
Aniline pt, °C.: 54.6
Aromatics, vol %: 21.0
Smoke pt, mm: 23.0
Sulfur, wt %: 0.095

Diesel
Range (TBP), °C.: 230-375
Yield, vol %: 25.8
Gravity, °API: 34.49
Sulfur, wt %: 1.18
Pour pt, °C.: −12
Aniline pt, °C.: 69.6
Diesel index: 54.8
Cetane index: 51.2

Residue
Range (TBP), °C.: 350 +
Yield, vol %: 37.4
Gravity, °API: 19.1
Kin. vis., cSt @ 50° C.: 104.7
Pour pt, °C.: +27
Sulfur, wt %: 2.78
Asphaltenes, wt %: 0.1
Con. carbon, wt %: 5.3
V/Ni, ppm: 7.1/1.9

Residue
Range (TBP), °C.: 550 +
Yield, vol %: 12.3
Gravity, °API: 10.15
Kin. vis., cSt @ 100° C.: 315
Pour pt, °C.: +21
Sulfur, wt %: 3.73
Asphaltenes, wt %: 0.24
Con. carbon, wt %: 14.4
V/Ni, ppm: 19.0/5.0

Zakum (Lower Zakum/ Abu Dhabi Marine), Abu Dhabi

Das Island

Crude
Gravity, °API: 40.6
Rvp @ 37.8 °C., psia: 8.37
Pour pt, °C.: −21
Kin. vis., cSt @ 20° C.: 4.28
Sulfur, wt %: 1.05
Charac. factor, K_{UOP}: 12.28
Asphaltene content, wt %: 0.05

Light straight run
Range (TBP), °C.: C_5-80
Yield, vol %: 8.6
Gravity, API: 82.7
Rvp @ 100 °F., psia: 11.6
Sulfur, ppm: 1.5
RON, clear: 66
MON, clear: 64

Naphtha
Range (TBP), °C.: C_5-160
Yield, vol %: 25.60
Gravity, °API: 66.5
Sulfur, ppm: 16.0

Kerosine
Range (TBP), °C.: 160-250
Yield, vol %: 18.8
Gravity, °API: 46.15
Kin. vis., cSt @ −20° C.: 4.10
Freeze pt, °C.: −48
Aniline pt, °C.: 58
Aromatics, vol %: 21.7
Smoke pt, mm: 23.5
Sulfur wt %: 0.063

Diesel
Range (TBP), °C.: 190-343
Yield, vol %: 29.30
Gravity, °API: 39.52
Sulfur, wt %: 0.52
Cloud pt, °C.: −18
Pour pt, °C.: −21
Vis., cSt @ 40° C.: 2.20
Aniline pt, °C.: 66.8
Diesel index: 60.2
Cetane index: 56.5

Residue
Range, °C.: 350 +
Yield, vol %: 33.7
Gravity, °API: 21.8
Kin. vis., cSt @ 50° C.: 69.1
Pour pt, °C.: +33
Sulfur, wt %: 2.2
Asphaltenes, wt %: 0.2
Con. carbon, wt %: 4.0
V/Ni, mg/kg: 1.0/0.9

Residue
Range, °C.: 550 +
Yield, vol %: 10.10
Gravity, °API: 13.2
Kin. vis., cSt @ 100° C.: 147.6
Pour pt, °C.: +18
Sulfur, wt %: 2.96
Asphaltenes, wt %: 1.0
Con. carbon, wt %: 13.6
V/Ni, mg/kg: 3.0/2.5

North Sea

Argyll, U.K. North Sea

SBM in producing area

Crude
Density @ 15° C.: 0.8349
Sulfur, wt %: 0.18
Pour pt, °C.: +6
Vis., cSt @ 40° C.: 4.79

Naphtha
Range, °C.: ibp—175
Yield, vol %: 25.2
Density @ 15° C.: 0.728
Sulfur, wt %: <0.001

Kerosine
Range, °C.: 175-260
Yield, vol %: 14.9

Density @ 15° C.: 0.804
Sulfur, wt %: 0.03
Copper strip test: 1.A
Smoke pt, mm: 22
Freeze pt, °C.: —37

Gas oil
Range, °C.: 260-360
Yield, vol %: 18.9
Density @ 15° C.: 0.839
Sulfur, wt %: 0.11
Cetane index: 64.5
Cloud pt, °C.: 0
Pour pt, °C: —3
Cold filter pt, °C.: —2
Vis., cSt @ 40° C.: 4.45

Residue
Range, °C.: 360+
Yield, vol %: 40.6
Density @ 15° C.: 0.9136
Sulfur, wt %: 0.34
V/Ni/Fe, ppm: 3.9/2.1/2.7
Pour pt, °C: +30
Vis., cSt @ 100° C.: 17.19

Auk, U.K. North Sea

SBM in producing area

Crude
Gravity, °API @ 60° F.: 37.15
Sulfur, wt %: 0.45
Wax, wt %: 6.5
Pour pt (ASTM max.), °C./°F.: +9/+50
Kin. vis., cSt @ 40° C.: 4.38
H_2S existent/potential ppm: <1/<1
Acid value, mg KOH/g (TAN): 0.13
Rvp, lb: 6
C_4—, vol %/wt %: 2.2/1.5

Gasoline
Range, °C.: C_5—85
Yield, vol %/wt %: 8.0/6.5
Sp gr @ 15° C.: 0.685
RON, clear: 66
RON + 0.5 g Pb/l Pb: 82

Naphtha
Range, °C.: 85-165
Yield, vol %/wt %: 15.5/14.0
Sp gr @ 15° C.: 0.755
Sulfur, wt %: 0.002
P/N/A, wt %: 51/34/15

Kerosine
Range, °C.: 165-235
Yield, vol %/wt %: 13.0/12.5
Sp gr @ 15° C.: 0.802
Sulfur, wt %: 0.01
Smoke pt, mm: 25
Aromatics, vol %: 19

Gas oil
Range, °C.: 235-300
Yield, vol %/wt %: 12.5/12.4
Sp gr @ 15° C.: 0.828
Sulfur, wt %: 0.09
Cetane no.: 60
Cloud pt, °C: —19

Gas oil
Range, °C.: 300-350
Yield, vol %/wt %: 9.4/9.6
Sp gr @ 15° C.: 0.847
Sulfur, wt %: 0.35
Cetane no.: 63
Cloud pt, °C.: +9
Kin. vis., cSt @ 40° C.: 5.53

Residue
Range, °C.: 350+
Yield, vol %/wt %: 39.2/43.5
Sp gr @ 15° C.: 0.932
Sulfur, wt %: 0.93
Wax, wt %: 13
Pour pt, °C.: +45
Kin vis., cSt @ 60° C.:96.7

@ 100° C.: 20.7
Acid value: 0.15
Asphaltenes, wt %: 4.0
Con. car. residue: 7%
V/Ni, ppm: 14/3

Beatrice, U.K. North Sea

Nigg Bay terminal

Crude
Gravity, °API: 38.7
Sulfur, wt %: 0.05
Pour pt, °F.: 55
Rvp, psi.: 5.60
Vis., cSt @ 104° F.: 6.85
@ 122° F.: 5.15
C_1—C_5, yield, vol %: 3.77

Light naphtha
Range, VT °F.: 68-158
Yield, vol %: 3.6
Gravity, °API: 86.5
Rvp, psi: 7.9
RON, clear: 64.6
MON, clear: 63.2
Paraffins, vol %: 93.1
Naphthenes, vol %: 6.2
Aromatics, vol %: 0.7

Naphtha
Range, °F.: 158-212
Yield, vol %: 3.5
Gravity, °API: 67.0
Total sulfur, wt %: 0.0002
P/N/A, vol %: 63.7/32.0/4.3

Heavy naphtha
Range, °F.: 212-302
Yield, vol %: 7.3
Gravity, °API: 59.4
Total sulfur, wt %: 0.0004
P/N/A vol %: 69.2/18.6/12.2

Kerosine
Range, °F.: 302-401
Yield, vol %: 8.8
Gravity, °API: 52.4
Total sulfur, wt %: 0.0024
Smoke point, mm: 37
Freeze pt, °F.: —67
Cloud pt, °F.: —70
Pour pt, °F.: —75
Aniline pt, °F.: 148.4
Diesel index: 78
Aromatics, vol %: 8.5
Vis., cSt @ 100° F.: 1.08
@ 210° F.: 0.59

Middle distillate
Range, °F.: 401-509
Yield, vol %: 10.8
Gravity °API: 44.6
Total sulfur, wt %: 0.0081
Aniline pt, °F.: 163.9
Diesel index: 73
Cetane index: 59
Cloud pt, °F.: —4
Pour pt, °F.: —10
Vis., cSt @ 100° F.: 1.89
@ 212° F.: 0.88

Middle distillate
Range, °F.: 401-650
Yield, vol %: 25.8
Gravity, °API: 41.7
Total sulfur, wt %: 0.0191
Aniline pt, °F.: 176.8
Diesel index: 74
Cetane index: 65
Cloud pt, °F.: 38
Pour pt, °F.: 35
Vis., cSt @ 212° F.: 1.21

Gas oil
Range, °F.: 650-1,049
Yield, vol %: 34.7
Gravity, °API: 31.5
Total sulfur, wt %: 0.061
Aniline pt, °F.: 221.3
Con. carbon, wt %: 0.14
Pour pt, °F.: 105
Vis., cSt @ 212° F.: 5.03
V/Ni/Fe, wt ppm: 0.13/0.03/0.18

Residue
Range, °F.: 1,049+
Yield, vol %: 14.4
Gravity °API: 18.7
Total sulfur, wt %: 0.15
Con. carbon, wt %: 9.3
Vis., cSt @ 212° F.: 150
V/Ni/Fe, wt ppm: 0.95/4.20/16.50

Beryl, U.K. North Sea

SBM in producing area

Crude
Gravity, °API: 36.5
Kin. vis., cSt @ 59° F.: 9.47
Con. carbon residue, wt %: 1.3
Sulfur, wt %: 0.42
Rvp, psi: 5.2
V/Ni, ppm: 3.7/0.8
C_5 & lighter, vol %: 4.27

Naphtha
Range (TBP), °F.: 60-120
Yield, vol %: 2.29
Rvp, psi: 17.5
Paraffins, vol %: 97.5
Naphthenes, vol %: 2.5
Aromatics, vol %: 0.0
RON, clear: 80.5

Naphtha
Range, °F.: 120-330
Yield, vol %: 21.89
Sp gr, 60°/60° F.: 0.7519
Rvp, psi: 2.5
P/N/A, vol %: 48.7/33.8/17.6
RON, clear: 61.4
RON + 3 ml TEL: 81.6
Sulfur, wt %: 0.0014
Nitrogen, ppm: 2.2

Kerosine
Range, °F.: 330-425
Yield, vol %: 10.70
Sp gr: 0.7976
P/N/A, vol %: 42.5/36.4/21.1
Sulfur, wt %: 0.0168

Light gas oil
Range, °F.: 425-650
Yield, vol %: 24.75
Sp gr: 0.8441
Gravity, °API: 36.1
Pour pt, °F.: 5
Aniline pt, °F.: 155.5
Diesel index: 56
Cetane index: 51
Sulfur, wt %: 0.21

Heavy gas oil
Range, °F.: 650-995
Yield, vol %: 25.89
Gravity, °API: 26.1
Sp gr: 0.8981
Pour pt, °F.: 95
Kin. vis., cSt @ 100° F.: 38.30
Aniline pt, °F.: 190.8
Total nitrogen, ppm: 1,317

Residue
Range, °F.: 995+
Yield, vol %: 12.95
Gravity, °API: 14.4
Sp gr, 60/60° F.: 0.9698
Pour pt, °F.: 120
Kin. vis., cSt @ 100° F.: 14,827.95
Sulfur, wt %: 1.04
Con. carbon, wt %: 8.80
V/Ni, ppm: 24.0/5.7

Residue
Range, °F.: 650+
Yield, vol %: 38.85
Gravity, °API: 22.0
Sp gr: 0.9220
Pour pt, °F.: 100
Kin. vis., cSt @ 100° F.: 190.47
Sulfur, wt %: 0.78
Total nitrogen, ppm: 2,258
Con. carbon, wt %: 3.14
V/Ni, ppm: 8.4/2.0

Brae, U.K. North Sea

Scheduled to join Forties system in mid 1983

Crude
Gravity, °API: 33.6
Sulfur, wt %: 0.73
Vis., cSt @ 10° C.: 13.6
Pour pt., °C.: —6
Carbon residue, wt %: 2.3
Asphaltenes, wt %: 0.35
V/Ni, ppm wt: 2.5/0.4
C_1—C_4, wt %: 2.15

Gasoline
Range (TBP), °C.: C_5—95
Yield, vol %: 9.25
Density @ 15° C., kg/l: 0.6985

Naphtha
Range, °C.: C_5—149
Yield, vol %: 21.45
Density @ 15° C., kg/l: 0.7405
Sulfur, wt %: 0.0005
P/N/A, wt %: 51.4/30.9/25.6

Kerosine
Range, °C.: 149-232
Yield, vol %: 15.2
Density @ 15° C., kg/l: 0.8125
Sulfur, wt %: 0.034
Aromatics, vol %: 25.7
Smoke pt, mm: 21
Cold test, °C.: —62
Aniline pt, °C.: 45.5
Diesel index: 49
Cetane index: 40

Gas oil
Range, °C.: 232-342
Yield, vol %: 21.3
Density @ 15° C., kg/l: 0.864
Sulfur, wt %: 0.55
Cloud pt, °C.: —15
Pour pt, °C.: —18
Acidity, mg KOH/g: 0.02
Aniline pt, °C.: 60.6
Diesel index: 45
Cetane index: 47

Residue
Range, °C.: 342+
Yield, vol %: 39.3
Density @ 15° C., kg/l: 0.9435
Sulfur, wt %: 1.41
Vis., cSt @ 50° C.: 128
Pour pt, °C.: 36
Carbon residue, wt %: 5.5
Asphaltenes, wt %: 0.75
V/Ni, ppm wt: 6.5/0.9

F.C.C. feed
Range, °C.: 369-509
Yield, vol %: 20.55
Density @ 15° C., kg/l: 0.921
Vis., cSt @ 100° C.: 7.22
Wax, wt %: 14
Aniline pt, °C.: 79.2

Note: Assay run on preproduction crude sample.

Brent, U.K. North Sea

Brent system to Sullom Voe and SPAR in producing area

Crude
Gravity, °API @ 60° F.: 38.16
Sulfur, wt %: 0.26
Wax, wt %: 6.5
Pour pt (ASTM max.), °C.: —3
Kin. vis., @ 40° C., cSt: 3.72
H_2S existent/potential, ppm: <1/<1
Acid value, mg KOH/g (TAN): 0.05
Rvp, lb: 8.5
C_4—, vol %: 3.2

Gasoline
Range, °C.: C_5—85
Yield, vol %: 7.5
Sp gr @ 15° C.: 0.692
RON, clear: 71
RON + 0.5 g Pb/l Pb: 85

Naphtha
Range, °C.: 85-165
Yield, vol %: 17.7
Sp gr @ 15° C.: 0.769
Sulfur, wt %: 0.003
P/N/A, wt %: 42/34/24

Kerosine
Range, °C.: 165-235
Yield, vol %: 13.5
Sp gr @ 15° C.: 0.806
Sulfur, wt %: 0.01
Smoke pt, mm: 23
Aromatics, vol %: 21

Gas oil
Range, °C.: 235-300
Yield, vol %: 12.9
Sp gr @ 15° C.: 0.840
Sulfur, wt %: 0.05
Cetane index: 52
Cloud pt, °C.: —19

Gas oil
Range, °C.: 300-350
Yield, vol %: 9.2
Sp gr @ 15° C.: 0.860
Sulfur, wt %: 0.25
Cetane index: 57.5
Cloud pt, °C.: +6
Kin. vis., cSt @ 40° C.: 6.36

Residue
Range, °C.: 350+
Yield, vol %: 36.5
Sp gr @ 15° C.: 0.913
Sulfur, wt %: 0.55
Wax, wt %: 13
Pour pt, °C.: +36
Kin. vis., cSt @ 40° C.: 51.8
  @ 100° C.: 13.5
Acid value 0.08
Asphaltenes, wt %: 0.05
V/Ni, ppm: 4/1.5

Note: This is assay of unblended Brent crude loaded at offshore SPAR.

Brent Blend, U.K. North Sea

Sullom Voe Terminal, Shetlands

Crude
Gravity, °API: 38.0
Vis., cSt @ 20° C.: 5.67
  @ 37.8° C: 3.64
Pour pt, °C.: —15
Rvp, psig: 12.8
Sulfur, wt %: 0.38
Wax, wt %: 5.2
Asphaltenes, wt %: 0.26
V/Ni/Fe, ppm: 3.8/0.80/0.10

Light naphtha
Range, °C.: C_5—75
Yield, vol %: 6.2
Gravity, °API; 78.3
RON, clear: 72.0
Paraffins, wt %: 79.2
Olefins, wt %: Nil
Naphthenes, wt %: 16.8
Aromatics, wt %: 4.0

Naphtha
Range, °C.: C_5—165
Yield, vol %: 24.5
Gravity, °API: 60.1
Sulfur, ppm: 15
P/O/N/A, wt %: 59.0/Nil/33.0/8.0

Kerosine
Range, °C.: 165-235
Yield, vol %: 12.6
Gravity, °API: 45.0
Sulfur, wt %: 0.043
Smoke pt, mm: 26
Freeze pt, °C.: —56
Aromatics, vol %: 17.9

Gas oil
Range, °C.: 165-350
Yield, vol %: 33.3
Gravity, °API: 39.1
Sulfur, wt %: 0.14
Cetane index: 53.0
Pour pt, °C.: —21
Vis., cSt @ 37.8° C.: 2.37
  @ 50° C.: 1.92
Aniline pt, °C.: 66.8

Gas oil
Range, °C.: 235-350
Yield, vol %: 20.7
Gravity, °API: 35.7
Sulfur, wt %: 0.19
Cetane index: 54.0
Pour pt, °C.: —12
Vis., cSt @ 37.8° C: 3.79
  @ 50° C.: 2.94
Aniline pt, °C.: 71.4

Vaccum gas oil
Range, °C.: 350-550
Yield, vol %: 28.3
Gravity, °API: 26.1
Sulfur, wt %: 0.57
Vis., cSt @ 100° F.: too waxy
Pour pt, °C.: +39
Con. carbon, wt %: 0.29
V/Ni/Fe, ppm: 0.05/0.02/0.14
UOP K factor: 12.3

Residue
Range, °C. 550+
Yield, vol %: 10.3
Gravity, °API: 11.5
Sulfur, wt %: 1.35
Vis., cSt @ 37.8° C.: too waxy
Wax content, wt %: 10.1
Pour pt, °C.: +42
Con. carbon, wt %: 15.7
V/Ni/Fe, ppm: 25/5.7/0.96

Note: Analysis run on sample from tanker at Sullom Voe mid October 1981. Contributors to Brent Blend in early 1983 were North and South Cormorant, Brent, Dunlin, Thistle, and Murchison.

Buchan, U.K. North Sea

CALM in producing area

Crude
Gravity, °API: 33.7
Sulfur, wt %: 0.84
Vis., cSt @ 20° C.: 20.37
Pour pt, °C.: 6
Carbon residue, wt %: 5.0
Total C_1—C_4, yield, wt %: 1.50
V/Ni, ppm wt %: 19/4

Gasoline
Range (TBP), °C.: C_5—95
Yield, vol %: 9.45
Paraffins, wt %: 71.2
Naphthenes, wt %: 24.5
Aromatics, wt %: 4.3

Naphtha
Range, °C: C_5—149
Yield, vol %: 19.9
Sulfur, wt %: 0.0009
P/N/A, wt %: 58.1/31.9/10.0

Kerosine
Range, °C.: 149-232
Yield, vol %: 14.45
Density @ 15° C., kg/l: 0.7965
Sulfur, wt %: 0.037
Aromatics, vol %: 18.8
Smoke pt, mm: 24
Aniline pt, °C.: 54.9
Diesel index: 60
Cetane index: 45

Gas oil
Range, °C.: 232-342
Yield, vol %: 20.55
Density @ 15° C., kg/l: 0.8465
Sulfur, wt %: 0.43
Vis., cSt @ 50° C.: 2.72
Pour pt, °C: —15
Aniline pt, °C: 68.0
Diesel index: 55
Cetane index: 54

Gas oil
Range, °C: 342-369
Yield, vol %: 4.2
Sulfur, wt %: 0.93
Pour pt: °C.: 15
Aniline, pt, °C.: 74.9
Diesel index: 50
Cetane index: 57

Gas oil
Range, °C.: 369-509
Yield, vol %: 20.15
Density @ 15° C., kg/l: 0.9055
Sulfur, wt %: 1.06
Vis., cSt @ 60° C.: 21.1
@ 100° C.: 6.76
Wax, wt %: 12.5
Aniline pt, °C.: 84.6

Residue
Range, °C.: 342+
Yield, vol %: 43.25
Density @ 15° C., kg/l: 0.950
Sulfur, wt %: 1.56
Vis., cSt @ 50° C.: 304
Pour pt, °C.: 36
Carbon residue, wt %: 10.5
V/Ni, wt ppm: 39/8
V/Ni, wt ppm: (509+ °C.): 84/18
Sulfur, wt % (509+ °C.): 2.17

Cormorant, North, U.K. North Sea

Brent system to Sullom Voe

Crude
Gravity, °API: 34.9
Density @ 15° C., kg/l: 0.850
Sulfur, wt %: 0.71
Pour pt, °C.: +12
Kin. vis., @ 40° C., sq mm/sec: 5.76
Acid value, mg KOH/g (TAN): <0.05
C_4—, vol %: 2.6

Gasoline
Range, °C.: C_5—85
Yield, vol %: 7.0
Density @ 15° C.: 0.677
RON, clear: 69
RON + 0.5 g Pb/l: 84

Naphtha
Range, °C.: 85-165
Yield, vol %: 14.5
Density @ 15° C.: 0.759
Paraffins, wt %: 49
Naphthenes, wt %: 39
Aromatics, wt %: 20

Kerosine
Range, °C.: 165-235
Yield, vol %: 11.7
Density @ 15° C: 0.804
Sulfur, wt %: 0.04
Smoke pt, mm: 24
Aromatics, vol %: 20

Gas oil
Range, °C.: 235-300
Yield, vol %: 12.5
Density @ 15° C.: 0.837
Sulfur, wt %: 0.24
Cetane index: 53
Cloud pt, °C.: —23

Gas oil
Range, °C: 300-350
Yield, vol %: 9.4
Density @ 15° C.: 0.860
Sulfur, wt %: 0.56
Cetane index: 58
Cloud pt, °C.: +8
Kin. vis., @ 40° C., sq mm/sec: 5.92

Residue
Range, °C.: 350+
Yield, vol %: 42.7
Density @ 15° C.: 0.916
Sulfur, wt %: 0.56
Wax, wt %: 12
Pour pt, °C.: +36
Kin. vis., @ 60° C., sq mm/sec: 101
@ 100° C.: 20.0
Acid value: 0.05
Asphaltenes, wt %: 0.66
Con. carbon, wt %: 5.4
V/Ni, ppm: 23/11

Note: This was designated a provisional assay in early 1983.

Cormorant, South (Cormorant "A"), U.K. North Sea

Brent system to Sullom Voe

Crude
Gravity, °API: 35.7
Density @ 15° C. (kg/l): 0.846
Sulfur, wt %: 0.56
Pour pt, °C.: —6
Kin. vis., @ 40° C. sq mm/sec: 5.0
Acid value, mg KOH/g (TAN): 0.05
C_4—, vol %: 2.8

Gasoline
Range, °C.: C_5—85
Yield, vol %: 7.5
Density @ 15° C.: 0.679
RON, clear: 71
RON + 0.5 g Pb/l: 85

Naphtha
Range, °C.: 85-165
Yield, vol %: 15.4
Density @ 15° C.: 0.764
Sulfur, wt %: 0.001
Paraffins, wt %: 44
Naphthenes, wt %: 39
Aromatics, wt %: 17

Kerosine
Range, °C.: 165-235
Yield, vol %: 12.9
Density @ 15° C.: 0.806
Sulfur, wt %: 0.03
Smoke pt, mm: 21
Aromatics, vol %: 21

Gas oil
Range, °C.: 235-300
Yield, vol %: 13.4
Density @ 15° C.: 0.840
Sulfur, wt %: 0.16
Cetane index: 51.5
Cloud pt, °C.: —18

Gas oil
Range, °C.: 300-350
Yield, vol %: 7.9
Density @ 15° C.: 0.863
Sulfur, wt %: 0.49
Cetane index: 52
Cloud pt, °C.: +5
Kin. vis., @ 40° C., sq mm/sec: 6.27

Residue
Range, °C.: 350+
Yield, vol %: 40.5
Density @ 15° C.: 0.931
Sulfur, wt %: 1.06
Wax, wt %: 10
Pour pt, °C.: 36
Kin. vis., @ 60° C., sq mm/sec.: 81.1
@ 100° C.: 16.1
Acid value: 0.1
Asphaltenes, wt %: 0.55
V/Ni, ppm: 3/21

Dan, Denmark North Sea

Contributor to Gorm Blend

Crude
Gravity, °API: 30.4
Sulfur, wt %: 0.34
Vis., cSt @ 40° C.: 8.90
Pour pt, °F.: <-45
C_4 & lighter, vol %: 0.8

Light gasoline
Range,° F.: C_5—200
Yield, vol %: 5.8%
Density, kg/l: 0.714
Sulfur, wt %: 0.002
RON, clear: 80.0

Naphtha
Range, °F.: 200-405
Yield, vol %: 20.3
Density, kg/l: 0.791
Sulfur, wt %: 0.05
RON, clear: 63.7

Light gas oil
Range, °F.: 405-650
Yield, vol %: 26.6
Density, kg/l: 0.868
Sulfur, wt %: 0.19
Pour pt, °F.: —45

Heavy gas oil
Range, °F.: 650-1,000
Yield, vol %: 30.0
Density, kg/l: 0.920
Sulfur, wt %: 0.42
Pour pt, °F.: 60
Vis., cSt @ 50° C.: 44.2

Atmospheric resid
Range, °F.: 650+
Yield, vol %: 46.5

Density, kg/l: 0.942
Sulfur, wt %: 0.55
Pour pt, °F.: 45
Vis., cSt @ 50° C.: 269
Carbon residue, wt %: 5.0

Vacuum residue
Range, °F.: 1,000+
Yield, vol %: 16.5
Density, kg/l: 0.977
Sulfur, wt %: 0.70
Pour pt, °F.: 100
Vis., cSt @ 100° C.: 326

Dunlin, U.K. North Sea

Brent system to Sullom Voe

Crude
Gravity, °API @ 60° F.: 34.9
Sulfur, wt %: 0.39
Wax, wt %: 5.0
Pour pt (ASTM max.), °C.: +6
Kin. vis., cSt @ 40° C.: 4.92
C_4—, vol %: 2.3

Gasoline
Range, °C.: C_5—85
Yield, vol %: 6.8
Sp gr @ 15° C.: 0.682
RON, clear: 69

Naphtha
Range, °C.: 85-165
Yield, vol %: 15.2
Sp gr @ 15° C.: 0.761
P/N/A, wt %: 42/43/15

Kerosine
Range, °C.: 165-235
Yield, vol %: 11.8
Sp gr @ 15° C.: 0.809
Sulfur, wt %: 0.025
Smoke pt, mm: 22
Aromatics, vol %: 21

Gas oil
Range, °C.: 235-300
Yield, vol %: 13.0
Sp gr @ 15° C.: 0.846
Sulfur, wt %: 0.13
Cetane index: 50
Cloud pt, °C.: —25

Gas oil
Range, °C.: 300-350
Yield, vol %: 10.0
Sp gr @ 15° C.: 0.864
Sulfur, wt %: 0.32
Cetane index: 56
Cloud pt, °C.: —1
Kin. vis., cSt @ 40° C.: 6.3

Residue
Range, °C.: 350+
Yield, vol %: 41.2
Sp gr @ 15° C.: 0.930
Sulfur, wt %: 0.74
Wax, wt %: 10
Pour pt, °C.: +33
Vis. kin., cSt @ 60° C.: 82.4
@ 100° C.: 18.3
Acid value: 0.2
Asphaltenes, wt %: 0.24
V/Ni, ppm wt %: 5/2

Ekofisk, Norway North Sea

Seal Sands, Teesside, U.K. terminal

Crude
Gravity, °API: 43.4
Sulfur, wt %: 0.14
Pour pt, °F.: 10
Vis., SUS @ 70° F.: 36.1
Rvp, psig: 5.0
Yield, C_1—C_5, wt %: 6.43

Gasoline
Range, °F.: Ibp—176
Yield, vol %: 11.9
RON, clear: 66

Naphtha
Range, °F.: 176-302
Yield, vol %: 20.2
Gravity, °API: 57.9
Paraffins, vol %: 53.1
Naphthenes, vol %: 36.8
Aromatics, vol %: 10.1
Sulfur, ppm: 3

Kerosine
Range, °F.: 302-400
Yield, vol %: 10.6
Gravity, °API: 48.7
Total sulfur, wt %: 0.002
Aniline pt, °F.: 137
Smoke pt, °F.: 23
Freezing pt, °F.: —85

Gas oil
Range, °F.: 400-662
Yield, vol %: 23.4
Gravity, °API: 38.0
Vis., cSt @ 100° F.: 3.01
Pour pt, °F.: 0
Aromatics, vol %: 17
Total sulfur, wt %: 0.07
Aniline pt, °F.: 162
Diesel index: 62

Gas oil
Range, °F.: 302-707
Yield, vol %: 37.3
Gravity, °API: 40.2
Pour pt, °F.: 5

Heavy gas oil
Range, °F.: 707-977
Yield, vol %: 13.2
Gravity, °API: 25.0
Vis., cSt @ 122° F.: 34.05
Pour pt, °F.: 97
Total sulfur, wt %: 0.25
Con. carbon, wt %: 0.047
Aniline, °F.: 200.5
V/Ni/Fe, ppm: 0.8/0.3/0.3

Residue
Range, °F.: 707+
Yield, vol %: 25.2
Gravity, °API: 20.9
Vis., SUS @ 212° F.: 117.2
Pour pt, °F.: 97
Sulfur, wt %: 0.40
Con. carbon, wt %: 4.3
V/Ni/Fe, ppm: 0.4/5.7/1.2

Note: Seven fields contribute to the Ekofisk Blend, which this assay represents. They are Ekofisk, West Ekofisk, Cod (pure gas condensate), Tor, Eldfisk, Edda, and Albuskjell. Condensate is not included in gasoline and naphtha blends listed.

Flotta, U.K. North Sea

Flotta terminal, Orkney Islands

Crude
Gravity, °API: 35.7
Sulfur, wt %: 1.14
Vis., cSt @ 40° F.: 30.8
@ 104° F.: 4.38
Pour pt, °F.: 21.0
C_4 & lighter, vol %: 4.3
Rvp @ 100° F., psi: 9.1

Naphtha
Range, °F.: C_5-149
Yield, vol %: 5.0
Sulfur, wt %: 0.001
Paraffins, vol %: 94.5
Naphthenes, vol %: 3.5
Aromatics, vol %: 1.5
RON, clear: 73.0
RON + 0.4 g Pb/l: 86.0
Rvp @ 100° F., psi: 18.2

Naphtha
Range, °F.: 149-302
Yield, vol %: 14.9
Gravity, °API: 59.9
Sulfur, wt %: 0.001
P/N/A, vol %: 66.0/27.5/16.0
RON, clear: 58.0

Naphtha
Range, °F.: 302-356
Yield, vol %: 5.6
Gravity, °API: 50.0
Sulfur, wt %: 0.04
Rvp @ 100° F., psi: 0.6
P/N/A, vol %: 49.5/30.5/19.5
Smoke pt, mm: 23
Freeze pt, °F.: −76

Kerosine
Range, °F.: 356-455
Yield, vol %: 8.0
Gravity, °API: 44.1
Sulfur, wt %: 0.11
Vis., cSt @ 104° F.: 1.23
Aromatics, vol %: 23.0
Smoke pt, mm: 20.5
Freeze pt, °F.: −48
Aniline pt, °F.: 129
Cloud pt, °F.: −66

Gas oil
Range, °F.: 455-572
Yield, vol %: 11.8
Gravity, °API: 37.0
Sulfur, wt %: 0.51
Vis., cSt @ 104° F.: 2.3
Aromatics, vol %: 28.0
Aniline pt, °F.: 141
Cloud pt, °F.: −10

Gas oil
Range, °F.: 572-650
Yield, vol %: 8.4
Gravity, °API: 32.5
Sulfur, wt %: 1.05
Vis., cSt @ 104° F: 4.78
Aromatics, vol %: 36.0
Aniline pt, °F.: 157
Cloud pt, °F.: 29

Gas oil
Range, °F.: 650-1,000
Yield, vol %: 28.5
Gravity, °API: 23.2
Sulfur, wt %: 1.69
Vis., cSt @ 122° F.: 25.8
Pour pt, °F.: 91
Aniline, pt °F.: 171
Con. carbon residue, wt %: 0.29
V/Ni/Fe, ppm: <1/1/2

Residue
Range, °F.: 650+
Yield, vol %: 42.0
Gravity, °API: 18.3
Sulfur wt %: 2.08
Vis., cSt @ 104° F.: 220
@ 122° F.: 127
Pour pt, °F.: 86
Aniline pt °F.: 173
Con. carbon, wt %: 5.9
V/Ni/Fe: <3/7/3

Note: Flotta is a blend made up of Piper, Claymore, and Tartan crudes. Tartan appears in this section while Piper and Flotta (before introduction of Tartan) are in OGJ, Dec. 3, 1979, p. 102.

Forties, U.K. North Sea

Hound Point terminal, Firth of Forth

Crude
Gravity, °API: 36.6
Sulfur, wt %: 0.30
Vis., cSt @ 10° C.: 9.6
@ 21.1° C.: 6.81
Pour pt, °C.: −3
Wax, wt %: 7.0
Carbon residue, wt %: 2.2
Asphaltenes, wt %: 0.2
V/Ni, ppm wt: 3/2
Watson K factor: 11.9
C_1-C_4, wt %: 2.74

Gasoline
Range (TBP), °C.: C_5-95
Yield, vol %: 9.23
Sulfur, wt %: <0.001
RON, clear: 69.5
RON + 0.44 ml TEL/l: 83
P/N/A, wt %: 71.1/25.7/3.2

Naphtha
Range, °C.: C_5-149
Yield, vol %: 20.02
Density @ 15° C., kg/l: 0.723
Sulfur, wt %: <0.001
RON, clear: 62
RON + 0.44 ml TEL/l: 77.5
P/N/A, wt %: 54.9/35.8/9.3

Kerosine
Range, °C.: 149-232
Yield, vol %: 14.50
Density @ 15° C., kg/l: 0.7995
Sulfur, wt %: 0.010
Aromatics, vol %: 19.5
Smoke pt, mm: 24
Cold test, °C.: −58
Aniline pt, °C.: 54
Diesel index: 59
Cetane index: 44

Gas oil
Range, °C.: 232-342
Yield, vol %: 20.92
Density @ 15° C., kg/l: 0.852
Sulfur, wt %: 0.14
Vis., cSt @ 37.8° C.: 3.5
@ 50° C.: 2.7
Cloud pt, °C.: −15
Pour pt, °C.: −15
Aniline pt, °C.: 67
Diesel index: 53
Cetane index: 52

Residue
Range, °C.: 342+
Yield, vol %: 40.96
Density @ 15° C., kg/l: 0.9265
Sulfur, wt %: 0.61
@ 50° C: 102
Pour pt, °C.: 33
Wax, wt %: 14.3
Carbon residue, wt %: 4.8
Asphaltenes, wt %: 0.5
V/Ni, ppm wt %: 7/4

FCC feed
Range, °C.: 369-509
Yield, vol %: 20.38
Density @ 15° C., kg/l: 0.9045
Sulfur, wt %: 0.44
Vis., cSt @ 37.8° C.: 45.6
Total nitrogen, ppm wt: 960
Aniline pt, °C.: 88

Note: Assay based on analyses of production crude samples obtained at rates of up to 400,000 b/d.

Fulmar, U.K. North Sea

SBM in producing area

Crude
Gravity, °API: 39.3
Density @ 15° C., kg/l: 0.828
Sulfur, wt %: 0.26
Pour pt, °C.: −12
Kin. vis., @ 40° C., sq mm/sec: 2.55
Acid value, mg KOH/g (TAN): 0.06
Yield C_4−, vol %: 2.7

Gasoline
Range, °C.: C_5-85
Yield, vol %: 19.5
Density @ 15° C.: 0.666
RON, clear: 71
RON + 0.5 g Pb/l: 85

Naphtha
Range, °C.: 85-165
Yield, vol %: 19.5
Density @ 15° C.: 0.757
Sulfur, wt %: 0.001
Paraffins, wt %: 55
Naphthenes, wt %: 26
Aromatics: 19

Kerosine
Range, °C.: 165-235
Yield, vol %: 15.7
Density @ 15° C.: 0.804
Sulfur, wt %: 0.02
Smoke pt: 23
Aromatics, vol %: 23

Gas oil
Range, °C.: 235-300
Yield, vol %: 12.2
Density @ 15° C.: 0.839
Sulfur, wt %: 0.06
Cetane index: 51.5

Gas oil
Range, °C.: 300-350
Yield, vol %: 9.5
Density @ 15° C.: 0.856
Sulfur, wt %: 0.26
Cetane index: 60
Cloud pt, °C.: +3
Kin. vis., @ 40° C., sq mm/sec: 5.70

Residue
Range, °C.: 350+
Yield, vol %: 33.1
Density @ 15° C.: 0.916
Sulfur, wt %: 0.56
Pour pt, °C.: +33
Kin. vis., @ 60° C.: sq mm/sec: 44.1
@ 100° C.: 11.3
Acid value: 0.08
Asphaltenes, wt %: 1.8
V/Ni, ppm: 5/1

Note: This has been designated a tentative assay.

Gorm, Denmark North Sea

SBM in producing area

Crude
Gravity, °API: 33.9
Sulfur, wt %: 0.23
Vis., cSt @ 40° C.: 5.44
Pour pt, °F.: −35
C_4 & lighter, vol %: 1.6

Light gasoline
Range, °F: C_5-300
Yield, vol %: 19.7
Density, kg/l: 0.729
Sulfur, wt %: 0.001
P/N/A vol %: 53/40/7

Naphtha
Range, °F.: 300-400
Yield, vol %: 10.0
Density, kg/l 0.800
Sulfur, wt %: 0.026
Smoke pt, mm: 23
Freezing pt, °F.: < −94
Aniline pt, °F.: 120
P/N/A vol %: 32/47/21

Kerosine
Range, °F.: 400-500
Yield, vol %: 12.1
Density, kg/l: 0.841
Sulfur, wt %: 0.065
Smoke pt, mm: 16
Freezing pt, °F.: −47
Cloud pt, °F.: −50
Pour pt, °F.: −60
Aniline pt, °F.: 134

Diesel oil
Range °F.: 500-650
Yield, vol %: 15.9
Density, kg/l: 0.865
Sulfur, wt %: 0.16
Cloud pt, °F.: 16
Pour pt, °F.: 20
Aniline pt., °F.: 155

Gas oil
Range, °F: 650-815
Yield, vol %: 15.0
Density, kg/l: 0.903
Sulfur, wt %: 0.30
Nitrogen, wt %: 0.08
Pour pt, °F.: 70
Aniline pt., °F.: 176
Vis., cSt @ 50° C.: 19.9

Heavy gas oil
Range, °F.: 815-1,000
Yield, vol %: 10.8
Density, kg/l: 0.924
Sulfur, wt %: 0.37
Nitrogen, wt %: 0.18
Pour pt, °F.: 100
Aniline pt, °F.: 196
Vis cSt @ 50° C.: 110

Residuum
Range, °F: 1,000+
Yield, vol %: 14.9
Density, kg/l: 0.972
Sulfur, wt %: 0.59
Nitrogen, wt %: 0.60
Hydrogen, wt %: 11.2
Carbon residue, wt %: 9.6
Vis., cSt @ 100° C.: 300
V/Ni, ppm: 65/40

Note: Subsequent to this assay Gorm has been joined by crude from Dan field (13% of blend in late 1982) and Skjold field (6% of blend). Skjold is marginal field. Dan has gravity of 30.4° API & sulfur content of 0.34 wt %.

Gullfaks, Norway North Sea

Block 34/10—Not yet in production

Crude
Gravity, °API: 28.6
Sp gr, 60/60: 0.8838
Sulfur, wt %: 0.44
Pour pt, °F.: −50
Vis., cSt @ 100° F.: 10.14

Gasoline
Range, °C.: 20-70
Yield, wt %: 0.8
Sp gr, 60/60: 0.6948
Sulfur, wt ppm: 100
RON, clear: 82.9

Paraffins, wt %: 66
Naphthenes, wt %: 32.1
Aromatics, wt %: 1.9

Gasoline
Range, °C.: 70-100
Yield, wt %: 2.6
Sp gr, 60/60: 0.7433
Sulfur, wt ppm: 500
P/N/A, wt %: 34.8/58.3/6.9

Gasoline
Range, °C.: 100-150
Yield, wt %: 7.0
Sp gr, 60/60: 0.7808
Sulfur, wt %: 0.0023
P/N/A, wt %: 33/44.6/22.4
Yield, wt %: 7.0

Gasoline
Range °C.: 150-190
Yield, wt %: 6.6
Sp gr, 60/60: 0.8056
Sulfur, wt %: 0.0116
P/N/A, wt %: 42.5/32.3/25.2

Kerosine
Range, °C.: 150-205
Yield, wt %: 9.2
Sp gr, 60/60: 0.8108
Sulfur, wt %: 0.0148
Smoke pt, mm: 20
Diesel index: 48
Vis., cSt @ 100° F.: 1.03

Gas oil
Range, °C.: 205-343
Yield, wt %: 28.4
Sp gr, 60/60: 0.8676
Sulfur, wt %: 0.1935
Diesel index: 43
Vis., cSt @ 100° F.: 3.61

Residue
Range, °C.: 343+
Yield, wt %: 51.8
Gravity, °API: 19.3
Sp gr, 60/60: 0.9382
Sulfur, wt %: 0.77
Con. carbon, wt %: 3.8
Vis., cSt @ 100° F.: 351
Pour pt, °F.: 15

Note: This is a preliminary assay.

Magnus, U.K. North Sea

Ninian system to Sullom Voe (hookup slated mid 1983)

Crude
Gravity, °API: 39.3
Sulfur, wt %: 0.28
Pour pt, °C.: −3
Vis., cSt @ 21.1 °C.: 4.56
Carbon residue, wt %: 1.6
V/Ni, ppm wt %: 4/<2
Total C_1-C_4, wt %: 3.15

Gasoline
Range (TBP),°C.: C_5-95
Yield, wt %: 9.8

Naphtha
Range, °C.: 95-175
Yield, wt %: 16.75
P/N/A, wt %: 39.2/41.3/19.5

Naphtha
Range, °C.: C_5-149
Yield, wt %/vol %: 21.45/24.25
Density @ 15° C., kg/l: 0.733
Sulfur, wt %: 0.0015
P/N/A, wt %: 52.9/33.8/13.3

Kerosine
Range, °C.: 149-232
Yield, wt %/vol %: 15.0/15.5
Density @ 15 °C., kg/l: 0.8015
Sulfur, wt %: 0.0085
Acidity, mg KOH/g: 0.03
Aromatics, vol %: 19.9
Cold test, °C.: −53.5
Aniline pt, °C.: 54.2
Cetane index: 44

Gas oil
Range, °C.: 232-342
Yield, wt %/vol %: 21.4/20.9
Density @ 15° C., kg/l: 0.8485
Sulfur, wt %: 0.15
Pour pt, °C.: −15
Acidity, mg KOH/g: 0.05
Aniline pt, °C.: 68.0
Diesel index: 54
Cetane index: 53

Gas oil
Range, °C.: 342-369
Yield, wt %/vol %: 4.4/4.15
Density @ 15° C., kg/l: 0.8755
Sulfur, wt %: 0.39
Vis., cSt @ 50° C.: 6.85
Pour pt, °C.: 12
Aniline pt, °C.: 77.1
Diesel index: 51
Cetane index: 58

Gas oil
Range, °C.: 369-509
Yield, wt %/vol %: 21.15/19.45
Density @ 15° C., kg/l: 0.8995
Sulfur, wt %: 0.43
Vis., cSt @ 98.9° C.: 6.27
Wax, wt %: 17.5
Aniline pt, °C.: 89.1

Residue
Range, °C.: 342+
Yield, wt %/vol %: 39.0/35.15
Density @ 15° C., kg/l: 0.918
Sulfur, wt %: 0.57
Vis., cSt @ 50° C.: 69
Carbon residue, wt %: 4.5
Asphaltenes, wt %: 0.35
V/Ni, ppm wt: 11/4

Residue
Range, °C.: 509+
Yield, wt %/vol %: 13.45/11.55
Density @ 15° C., kg/l: 0.965
Sulfur, wt %: 0.80
Vis., cSt @ 98.9 °C.: 122
Carbon residue, wt %: 12.0
V/Ni, ppm wt %: 30/7

Note: Preliminary guide to Magnus, which was not in production when assay sample obtained.

Maureen, U.K. North Sea

Not yet in production. Production expected late 1983 or early 1984.

Crude
Gravity, °API @ 60° F.: 35.8/35.3*
Sulfur, wt %: 0.55
Pour test, °F.: +45
Vis., SUS @ 70° F.: 78.92/81.79*
C_4−, vol %: 2.6

Gasoline
Range, °F.: 60-200
Yield, vol %: 9.0
Sulfur, wt %: 0.002
RON, clear: 72.5
RON + 3 ml TEL/gal: 91.3

Naphtha
Range, °F.: 60-400
Yield, vol %: 27.9
P/N/A, vol %: 57.32/31.96/10.72
Sulfur, wt %: 0.002
RON, clear: 52.8
RON + 3 ml TEL/gal: 77.8

Kerosine
Range, °F.: 400-500
Yield, vol %: 12.3
Gravity, °API: 39.7
Vis., SUS @ 100° F.: 32.15
Freeze pt, °F: −42
P/N/A, vol %: 37.8/40.1/22.1
Sulfur, wt %: 0.05
Aniline pt, °F.: 141.0
Smoke pt, mm: 20

Gas oil
Range, °F.: 500-650
Yield, vol %: 15.6
Gravity, °API: 34.0
Vis., SUS @ 100° F.: 42.34
Pour pt, °F.: +20
P/N/A, vol %: 34.3/39.8/25.9
Sulfur, wt %: 0.17
Aniline pt, °F.: 163.3
Cetane index: 55.5

Topped crude
Range, °F.: 650+
Yield, vol %: 41.6
Gravity, °API: 19.8
Vis., SUS @ 210° F.: 101.05
Pour pt, °F.: +90
Sulfur, wt %: 0.64
Rams. car. residue, wt %: 5.07
V/Ni, ppm 9.5/4.5

Note: The inspection of fractions is based on composite of three drillstem test samples.
* Results from two samples.

Montrose, U.K. North Sea

SBM in producing area

Crude
Gravity, °API: 40.1
Sulfur, wt %: 0.23
Rvp, psi: 4.0
Pour pt, °F.: 15
Neut. no., mg KOH/g: 0.28
Rams. carbon, wt %: 1.3
Vis kin., cSt @ 68° F.: 4.96
@ 100° F.: 3.27
V/Ni, ppm: 2/2
C_4−, vol %: 2.2

Gasoline
Range (TBP), °F.: C_5-200
Yield, vol %: 12.3
Sulfur, wt %: 0.002
P/N/A, vol %: 70.0/27.1/2.9
RON, clear: 71.4
RON + 3 cc TEL/gal: 89.5

Naphtha
Range, °F.: 200-320
Yield, vol %: 15.0
Gravity, °API: 55.5
Sulfur, wt %: 0.001
Charac. factor: 11.84
P/N/A vol %: 56.2/33.5/10.3
RON, clear: 42.8
RON + 3 cc TEL/gal: 68.0

Kerosine
Range, °F.: 320-400
Yield, vol %: 8.9
Gravity, °API: 47.7
Sulfur, wt %: 0.005
Aniline pt, °F.: 137.7
Diesel index: 65.7

Cetane index: 45.1
Freeze pt, °F.: −75
Smoke pt, mm: 24

Gas oil
Range, °F.: 400-650
Yield, vol %: 25.4
Gravity, °API: 38.2
Sulfur, wt %: 0.082
Aniline pt, °F.: 161.1
Diesel index: 61.6
Cetane index: 55.1
Cloud pt, °F.: 10
Pour pt, °F.: 4
Vis., SUS @ 100° F.: 35.2
Total nitrogen, wt %: 0.009

Residue
Range, °F.: 650+
Yield, vol %: 36.6
Gravity, °API: 23.7
Sulfur, wt %: 0.5
Pour pt, °F.: 80
Total nitrogen, wt %: 0.136
Rams. carbon, wt %: 3.3
Vis., SUS @ 122° F.: 334.6
@ 210° F.: 67.1
V/Ni, ppm: 4/4

Murchison, U.K. & Norway, North Sea

Brent system to Sullom Voe terminal

Crude
Gravity, °API: 38.0
Kin. vis., @ 100° F.: 3.60
Con. carbon residue, wt %: 1.1
Sulfur, wt %: 0.27
V/Ni, ppm: 2.5/0.7
Pour pt, °C.: +7.2
Rvp, psi: 9.0
C_4 & lighter, vol %: 3.0

Naphtha
Range (TBP), °F.: 86-375
Yield, vol %: 31.2
Paraffins, vol %: 55.5
Naphthenes, vol %: 32.8
Sulfur, wt %: <0.01

Kerosine
Range, °F.: 375-520
Yield, vol %: 13.5
Gravity, °API: 42.2
Sulfur, wt %: 0.02
Aromatics, vol %: 17

Heavy distillate
Range, °F.: 520-700
Yield, vol %: 21.4
Gravity, °API: 34.1
Sulfur, wt %: 0.16

Gas oil
Range, °F.: 700-1,020
Yield, vol %: 21.0
Gravity, °API: 25.8
Sulfur, wt %: 0.43

Residue
Range, °F.: 1,020+
Yield, vol %: 11.9
Gravity, °API: 13.7
Sulfur, wt %: 0.93
Kin. vis. @ 210° F.: 196
Con. carbon residue, wt %: 11.8
V/Ni, ppm: 18/5

Ninian Blend, U.K. North Sea

Ninian system to Sullom Voe terminal

Crude
Gravity °API: 35.6
Sulfur, wt %: 0.43
Vis., cSt @ 40° C.: 5.61
Pour pt, °F.: 35
C_4 & lighter, vol %: 2.6

Light gasoline
Range, °F.: C_5-300
Yield, vol %: 19.9
Density, kg/l: 0.726
Sulfur, wt %: 0.001
Paraffins, vol %: 63
Naphthenes, vol %: 27
Aromatics, vol %: 10

Naphtha
Range, °F.: 300-400
Yield, vol %: 9.3
Density kg/l: 0.788
Sulfur, wt %: 0.006
Smoke pt, mm: 27
Aniline pt, °F.: 128
P/N/A, vol %: 44/40/16

Kerosine
Range, °F.: 400-500
Yield, vol %: 11.1
Density, kg/l: 0.828
Sulfur, wt %: 0.047
Smoke pt, mm: 21
Freeze pt, °F.: −33
Cloud pt, °F.: −40
Pour pt, °F.: −40
Aniline pt, °F.: 143

Diesel oil
Range, °F.: 500-650
Yield, vol %: 14
Density, kg/l: 0.852
Sulfur, wt %: 0.23
Cloud pt, °F.: 20
Pour pt, °F.: 20
Aniline pt, °F.: 164

Gas oil
Range, °F.: 650-815
Yield, vol %: 13.1
Density, kg/l: 0.883
Sulfur, wt %: 0.46
Nitrogen, wt %: 0.05
Pour pt, °F.: 75
Aniline pt, °F: 184
Vis., cSt @ 50° C.: 10.7

Heavy gas oil
Range, °F.: 815-1,000
Yield, vol %: 14.0
Density, kg/l: 0.906
Sulfur, wt %: 0.60
Nitrogen, wt %: 0.10
Pour pt, °F: 110
Aniline pt, °F: 205
Vis., cSt @ 50° C.: 71.3

Residue
Range, °F.: 1,000+
Yield, vol %: 16.0
Density, kg/l: 0.982
Sulfur, wt %: 1.2
Nitrogen, wt %: 0.40
Carbon residue, wt %: 11.7
Vis., cSt @ 100° C.: 291
V/Ni, ppm: 24/4

Note: This assay prepared when Heather field made up of 10% Ninian Blend. Magnus field is scheduled to contribute to Ninian system in mid 1983.

Statfjord, Norway & UK, North Sea

"A" and "B" SPM buoys in producing area

Crude
Gravity, °API: 38.4
Pour pt, °F.: 40
Kin. vis., @ 59° F.: 7.33
Con. carbon residue, wt %: 1.32
Sulfur, wt %: 0.27
Rvp, psi: 5.5
Total nitrogen, ppm: 1.03
V/Ni, ppm: 0.53/1.03
C_5 & lighter, vol %: 5.08

Naphtha
Range (TBP), °F.: 60-100
Yield, vol %: 6.49
Sp gr, 60° F./60° F.: 0.6740
Rvp, psi: 10.3
Paraffins, vol %: 80.1
Naphthenes, vol %: 17.8
Aromatics, vol %: 2.1

Naphtha
Range, °F.: 100-360
Yield, vol %: 22.12
Sp gr 0.7603
P/N/A: 48.9/37.3/13.8
RON, clear: 51.3
RON +3 ml TEL: 74.2
Sulfur, wt %: 0.0037

Kerosine
Range, °F.: 360-503
Yield, vol %: 15.08
P/N/A, vol %: 48.1/34.6/17.2
Freeze pt, °F.: −47
Cloud pt, °F.: −52
Smoke pt, mm: 20
Aniline pt, °F: 142.1
Diesel index: 60
Cetane index: 49
Sulfur, wt %: 0.03

Light gas oil
Range, °F.: 503-710
Yield, vol %: 22.22
Sp gr, 60° F./60° F.: 0.8526
Gravity, °API: 34.5
Pour pt, °F.: 25
Aniline pt, °F.: 166

Heavy gas oil
Range, °F.: 710-946
Yield, vol %: 22.09
Gravity, °API: 25.6
Pour pt, °F.: 105
Kin. vis., cSt @ 100° F.: 66.27
Aniline pt, °F.: 200
Sulfur, wt %: 0.40
Basic nitrogen, ppm: 375
Con. carbon residue, wt %: 0.07

Residue
Range, °F.: 946+
Yield, vol %: 9.84
Gravity, °API: 14.2
Pour pt, °F.: 120
Kin. vis., cSt @ 100° F.: 24,732.61
Sulfur, wt %: 0.74
Total nitrogen, ppm: 1,750
Con. carbon, wt %: 10.58
V/Ni, ppm: 8.1/5.7

Note: This assay is on production from Statfjord "A" platform. Statfjord "B" began operation in November 1982.

Tartan, U.K. North Sea

Flotta system

Crude
Gravity, °API: 41.7
Sulfur, wt %: 0.56
Vis., cSt @ 40° F.: 11.6
Pour pt, °F.: 16
C_4 & lighter, vol %: 3.5
Rvp @ 100° F., psi: 10.2

Naphtha
Range, °F.: C_5-149
Yield, vol %: 5.7
Sulfur, wt %: 0.001
Paraffins, vol %: 97.0
Naphthenes, vol %: 1.5
Aromatics, vol %: 1.0
RON, clear: 70.2

Naphtha
Range, °F.: 149-302
Yield, vol %: 20.0
Gravity, °API: 58.5
Sulfur, wt %: 0.01
P/N/A, vol %: 56.5/25.5/17.5
RON, clear: 56.6

Naphtha
Range, °F.: 302-356
Yield, vol %: 7.1
Gravity, °API: 49.4
Sulfur, wt %: 0.06
P/N/A, vol %: 50/30/19.5

Kerosine
Range, °F.: 356-455
Yield, vol %: 10.8
Gravity, °API: 44.0
Sulfur, wt %: 0.1
Aromatics, vol %: 23.5
Smoke pt, mm: 20
Freeze pt, °F.: −52
Aniline pt, °F.: 135

Gas oil
Range, °F.: 455-572
Yield, vol %: 12.3
Gravity, °API: 37.3
Sulfur, wt %: 0.32
Aromatics, vol %: 28.0
Aniline pt, °F.: 149

Gas oil
Range, °F.: 572-650
Yield, vol %: 8.3
Gravity, °API: 34.0
Sulfur, wt %: 0.64
Aromatics, vol %: 32.0
Aniline pt, °F.: 167

Residue
Range, °F.: 650+
Yield, vol %: 32.3
Gravity, °API: 23.1
Sulfur, wt %: 1.22
Vis., cSt @ 122° F.: 55.5
Con. carbon residue, wt %: 2.5
V/Ni/Fe, ppm: 6.0/2.0/4.0

Note: Tartan is part of Flotta Blend.

Thistle, U.K. North Sea

Brent system to Sullom Voe terminal

Crude
Gravity, °API: 37.03
Vis., cSt @ 20° C.: 5.87
@ 37.8° C.: 4.26
Pour pt, °C.: 12
Rvp, psig: 7.5
H_2S, wt %: <0.01
Acid no., mg KOH/g: <0.05
Sulfur, wt %: 0.31
Wax, wt %: 7.7
Asphaltenes, wt %: 0.19
C_4—, wt % on crude (GLC): 0.69

Gasoline
Range, °C.: C_5-85
Yield, vol %/wt %: 7.0/5.6
Density @ 15° C., g/cc: 0.6771
Sulfur, wt %: <0.01
RON, clear/0.5 g TEL per liter: 71.6/84.7
PO/N/A, wt %: 64.0/Nil/25/11.0

Naphtha
Range, °C.: 85-165
Yield, vol %/wt %: 16.6/15.0
Density @ 15° C., g/cc: 0.7547
Sulfur, wt %: <0.01
P/O/N/A, wt %: 44.5/Nil/42.9/12.6

Kerosine
Range, °C.: 165-235
Yield, vol %/wt %: 12.6/11.9
Density @ 15° C., g/cc: 0.7984
Sulfur, wt %: 0.02
Smoke pt, mm: 24
Freeze pt, °C.: −51
Aniline pt, °C.: 58.7
Aromatics, vol %: 15.0

Light gas oil
Range, °C.: 235-300
Yield, vol %/wt %: 12.9/12.9
Density @ 15° C., g/cc: 0.8393
Sulfur, wt %: 0.06
Vis., cSt @ 37.8° C.: 2.46
Cetane index: 49.5
Pour pt, °C.: −24
Cloud pt, °C.: −22
Aniline pt, °C.: 65.9
Con. car. residue (on 10% residue), wt %: 0.004

Heavy gas oil
Range, °C.: 300-350
Yield, vol %/wt %: 9.6/9.8
Density @ 15° C., g/cc: 0.8494
Sulfur, wt %: 0.21
Vis., cSt @ 37.8° C.: 5.47
Cetane index: 58.5
Pour pt, °C.: 0
Cloud pt, °C.: 1
Aniline pt, °C.: 77.9
Con. car. residue (on 10% residue), wt %: 0.039

Residue
Range, °C.: 350+
Yield, vol %/wt %: 39.8/43.8
Density @ 15° C., g/cc: 0.9217
Sulfur, wt %: 0.63
Vis., cSt @ 98.9° C.: 14.77
Pour pt, °C.: 39
Asphaltenes, wt %: 0.95
Con. car. residue, wt %: 4.6
V/Ni, ppm: 7.5/1.9
-30

West African

Bonny Light, Nigeria

Bonny shore terminal and Bonny marine SBM (12 miles offshore in Atlantic)

Crude
Gravity, °API: 36.7
Sulfur, wt %: 0.12
Salt, lb/1,000 bbl: 12
Wax, wt %: 7.5
Carbon residue, wt %: 1.0
V/Ni, ppm wt: <2/3
Vis., cSt @ 37.8° C.: 3.47
Yield C_1—C_4, wt %: 2.10

Naphtha
Range (TBP), °C.: C_5—149
Yield, vol %: 20.85
Sulfur, wt %: 0.002
Watson K factor: 12.2
RON, clear: 68.5
RON + 0.44 ml TEL/l: 81.5
Paraffins, wt %: 42.6
Naphthenes, wt %: 47.6
Aromatics, wt %: 9.8

Kerosine
Range, °C.: 149—232
Yield, vol %: 16.8
Sulfur, wt %: 0.020
Aromatics, vol %: 17
Smoke pt, mm: 21
Freeze pt, °C.: −61
Aniline pt, °C.: 53
Diesel index: 54
Cetane index: 39

Gas oil
Range, °C.: 232—342
Yield, vol %: 27.1
Sulfur, wt %: 0.10
Cloud pt, °C.: −11
Pour pt, °C.: −12
Wax, wt %: 5.5
Aniline pt, °C.: 67
Diesel index: 51
Cetane index: 49

Heavy gas oil
Range, °C.: 369-–509
Yield, vol %: 19.6
Sulfur, wt %: 0.22
Vis., cSt @ 37.8° C.: 56.4
Pour pt, °C.: 39
Wax, wt %: 26
Total nitrogen, ppm wt: 1,180
Watson K factor: 11.9
Aniline pt, °C.: 86

Residue
Range, °C.: 342+
Yield, vol %: 32.6
Sulfur, wt %: 0.25
Vis., cSt @ 3.78° C.: 115
Pour pt, °C.: 39
Wax, wt %: 22
Total nitrogen, wt %: 0.24
Carbon residue, wt %: 2.7
V/Ni, ppm wt: 1/9
Watson K factor: 11.85

Note: Numerous fields contribute to Bonny Light and Medium blends, whose qualities are also influenced by national output. Analysis is on sample taken during period of high production.

Bonny Medium, Nigeria

Bonny shore terminal and Bonny marine CALM (12 miles offshore in Atlantic)

Crude
Gravity, °API: 25.2
Sulfur, wt %: 0.23
Vis., cSt @ 37.8 °C.: 12.1
Pour pt, °C.: −27
Carbon residue, wt %: 1.7
V/Ni, ppm wt: <1/7
C_1—C_4 yield, wt %: 0.52

Naphtha
Range (TBP), °C.: C_5—149
Yield, vol %: 6.31
Sulfur, wt %: 0.003
RON, clear: 73.5
RON + 0.44 ml TEL/l: 85.5
Paraffins, wt %: 32.8
Naphthenes, wt %: 54.7
Aromatics, wt %: 12.5

Kerosine
Range, °C.: 149—232
Yield, vol %: 12.85
Sulfur, wt %: 0.038
Aromatics, vol %: 16.5
Smoke pt, mm: 19
Freeze pt, °C.: < −70
Aniline pt, °C.: 49
Diesel index: 44
Cetane index: 32

Gas oil
Range, °C.: 232—343
Yield, vol %: 34.3
Density @ 15° C., kg/l: 0.889
Sulfur, wt %: 0.16
Vis., cSt @ 37.8 °C.: 4.7
Cloud pt, °C.: −32
Pour pt, °C.: −33
Aniline pt, °C.: 55
Diesel index: 36
Cetane index: 38

Heavy gas oil
Range, °C.: 369—509
Yield, vol %: 25.6
Density @ 15° C., kg/l: 0.9405
Sulfur, wt %: 0.31
Vis., cSt @ 37.8° C.: 162
Pour pt, °C.: 24
Total nitrogen, ppm wt: 1,790
Aniline pt, °C.: 72

Residue
Range, °C.: 342+
Yield, vol %: 45.95
Density @ 15° C., kg/l: 0.953
Sulfur, wt %: 0.37
Vis. @ 37.8 °C.: 515
Pour pt, °C.: 24
Carbon residue, wt %: 3.5
V/Ni, ppm wt: 2/15

Note: See note at end of Bonny Light assay.

Brass River, Nigeria

CALM some 12 miles off mouth of Brass

Crude
Gravity, °API @ 60° F.: 40.9
Sulfur, wt %: 0.09
Pour test, °F.: +35
Vis., SUS @ 70° F.: 38.66
Rvp, psi @ 100° F.: 6.9
Salt, lb/1,000 bbl: 3.8
V/Ni, ppm: 2.0/1.7
C_4 & lighter yield, vol %: 1.9

Gasoline
Range, °F.: 60—200
Yield, vol %: 11.2
Total sulfur, wt %: 0.001
RON, clear: 74.6
RON + 3 ml TEL/gal: 92.2
Rvp, psi: 12.4

Naphtha
Range, °F.: 200—300
Yield, vol %: 16.6
Paraffins, vol %: 44.97
Naphthenes, vol %: 43.52
Aromatics, vol %: 11.51
Total sulfur, wt %: <0.001

Naphtha
Range, °F.: 300—400
Yield, vol %: 11.5
P/N/A, vol %: 45.78/38.45/15.77
Total sulfur, wt %: 0.0087
Aniline pt, °F.: 128.0
Smoke pt, mm: 26

Kerosine
Range, °F.: 400-500
Yield, vol %: 16.9
Freezing pt, °F.: −36
P/N/A, vol %: 45.9/37.2/16.9
Total sulfur, wt %: <0.05
Aniline pt, °F.: 146.2
Smoke pt, mm: 20

Gas oil
Range, °F.: 500—650
Yield, vol %: 15.7
Gravity, °API: 33.9
Vis., SUS @ 100° F.: 41.41
Pour pt, °F.: +30
P/N/A, vol %: 47.0/32.1/20.9
Total sulfur, wt %: 0.06
Aniline pt, °F.: 167.2
Cetane index (determined): 57.4

Residua
Range, °F.: 650+
Yield, vol %: 26.5
Vis., SUS @ 210° F.: 53.55
Pour pt, °F.: +105
Total sulfur, wt %: 0.14
Rams. carbon residue, wt %: 2.31
V/Ni/Fe, ppm: 6.6/5.7/5.8

Heavy gas oil
Range (vac. flash), °F.: 625—1,100
Yield, vol %: 24.7
Aniline pt, F.: 190.1
Vis., SUS @ 130° F.: 127.55
Pour pt, °F.: +105
Sulfur, wt %: 0.33
Rams. carbon res., wt %: 0.67
V/Ni/Fe, ppm: 0.2/1.2/<0.2
Nitrogen, wt %: 0.139

Cabinda, Angola

CALM in producing area off Malongo terminal, Cabinda

Crude
Gravity, °API: 31.7
Sulfur, wt %: 0.17
Vis., SUS @ 100° F.: 93.5
Pour pt, °F.: +65
C_4 & lighter, vol %: 1.58
Rvp, psi: 3.8
V/Ni, ppm: 2.4/15.9
Salt, lb/1,000 bbl: 18
ASTM, 50% pt, °F.: >590

Light naphtha
Range (TBP), °F.: Ibp—140°
Yield, vol %: 2.18
Sulfur, wt %: 0.024
RON, clear: 77.3

Light naphtha
Range, °F.: 140—170
Yield, vol %: 1.67
Sulfur, wt %: 0.018
Paraffins, vol %: 77.6
Naphthenes, vol %: 21.4
Aromatics, vol %: 1.0
RON, clear: 65.1

Heavy naphtha
Range, °F.: 170—310
Yield, vol %: 9.98
Sulfur, wt %: 0.06
P/N/A, vol %: 50.0/44.8/5.2
Aniline pt, °F.: 134.4

Kerosine
Range, °F.: 310—520
Yield, vol %: 16.27
Gravity, °API: 43.7
Sulfur, wt %: 0.08
Freezing pt, °F.: −42
Aniline pt, °F.: 148.5
Cetane index: 50.8
Smoke pt, mm: 25

Light gas oil
Range, °F.: 520—680
Yield, vol %: 15.83
Gravity, °API: 34.9
Vis., SUS @ 100° F.: 44.4
Sulfur, wt %: 0.14
Pour pt, °F.: +35
Diesel index: 61.2
Cetane index: 60.5

Heavy gas oil
Range (TBP to EFV), °F.: 680—1,000
Yield, vol %: 29.34
Gravity, °API: 25.8
Vis., SUS @ 210° F.: 55.6
Sulfur, wt %: 0.16
Total nitrogen, ppm: 1,400
Pour pt, °F.: +115
Aniline pt, °F.: 210.2
V/Ni, ppm: >0.1/0.4

Residual oil
Range, °F.: 680+
Yield, vol %: 52.87
Gravity, °API: 20.4
Vis., SUS @ 210° F.: 210
Sulfur, wt %: 0.24
Con. carbon res., wt %: 5.82
Pour pt, °F.: +95
V/Ni, ppm: 4.2/28

*Does not include C_4 and lighter

Djeno Blend, Congo (Brazzaville)

CALM located 3.8 km from Djeno tank farm

Crude
Gravity, °API: 26.87
Vis., cSt @ 10° C.: 220
Pour pt, °C.: +3
Rvp @ 37.8° C., g/sq cm: 290
Total sulfur, wt %: 0.33
Acidity, mg KOH/g: 1.10
UOP charac. factor: 12.0
V/Ni, kg/mg: <1/23
Yield C_1—C_5, vol %: 2.37

Gasoline
Range, °C.: 15—80
Yield, vol %: 2.59
RON, clear: 69.0
Sulfur, wt %: 0.0876
Aromatics, vol %: 1.3

Naphtha
Range, °C.: 80—180
Yield, vol %: 11.86
Paraffins, vol %: 52.5
Naphthenes, vol %: 39.8
Aromatics, vol %: 7.7
Sulfur, wt %: 0.16

Kerosine
Range, °C.: 180—225
Yield, vol %: 5.90
Freezing pt, °C.: −51
Smoke pt, mm: 20
Sulfur, wt %: 0.20
Aromatics, vol %: 2.5

Gas oil
Range, °C.: 225—350
Yield, vol %: 21.88
Pour pt, °C.: −10
Cloud pt, °C.: −7
Sulfur, wt %: 0.17

Heavy gas oil
Range, °C.: 400—550
Yield, vol %: 21.88
Density 15/4 °C.: 0.926
Pour pt, °C.: +39
Vis., cSt @ 50° C.: 185
V/Ni, ppm: <0.5/<1
Sulfur, wt %: 0.25
Nitrogen, pm: 944
Aniline pt, °C.: 95.7
Con. carbon residue, wt %: 0.60

Residue
Range, °C.: 350+
Yield, vol %: 57.42
Density, 15/4 °C.: 0.952
Pour pt, °C.: +30
Vis., cSt @ 50° C.: 1,850
Sulfur, wt %: 0.41

Escravos, Nigeria

CALM in offshore producing area

Crude
Gravity, °API: 36.2
Sulfur, wt %: 0.14
Vis., SUS @ 100° F.: 37.6
Pour pt, °F.: +10
C_4 & lighter, vol %: 2.24
Rvp, lb: 4.3
V/Ni, ppm: 0.3/3.8
Salt, lb/1,000 bbl: 1
Uncondensed gases, vol %: 1.95

Light naphtha
Range (TBP), °F.: Ibp—140
Yield, vol %: 2.82
Gravity, °API: 88.0
Sulfur, wt %: 0.015
RON, clear: 82.6

Light naphtha
Range (TBP), °F.: 140—170
Yield, vol %: 1.60
Gravity, °API: 74.5
Sulfur, wt %: 0.009
P/N/A, vol %: 72.0/24.6/3.4
RON, clear: 75.0

Heavy naphtha
Range (TBP), °F.: 170—310
Yield, vol %: 16.13
Gravity, °API: 55.6
Sulfur, wt %: 0.013
P/N/A, vol %: 41.6/46.5/11.9
Aniline pt, °F.: 113.9

Kerosine
Range (TBP), °F.: 310—520
Yield, vol %: 28.55
Gravity, °API: 39.5
Sulfur, wt %: 0.06
Freezing pt, °F.: −51
Aniline pt, °F.: 131.4
Cetane index: 38.5
Smoke pt (ASTM), mm: 15

Light gas oil
Range (TBP), °F.: 520—680
Yield, vol %: 19.17
Gravity, °API: 31.1
Vis., SUS @ 100° F.: 44.9
Sulfur, wt %: 0.19
Pour pt, °F.: +30
Diesel index: 49.9
Cetane index: 47.0

Heavy gas oil
Range (TBP or EFV), °F.: 680—1,000
Yield, vol %: 23.76
Gravity, °API: 22.4
Vis., SUS @ 210° F.: 56.1
Sulfur, wt %: 0.22
Nitrogen (total), ppm: 1,700
Pour pt, °F.: +120
Aniline pt, °F.: 190.0
V/Ni, ppm: >0.1/0.9

Residual oil
Range (TBP or EFV), °F.: 680+
Yield, vol %: 29.78
Gravity, °API: 19.9
Vis., SUS @ 210° F.: 93.5
Sulfur, wt %: 0.27
Con. carbon residue, wt %: 3.72
Pour pt, °F.: +115
V/Ni, ppm: 1.0/11.5

Espoir, Ivory Coast

CALM yoke with permanent floating storage in producing area

Crude
Gravity, °API: 31.4
Sp gr @ 60° F.: 0.8686
Sulfur, wt %: 0.32
Pour test, °F.: +5
Vis., SUS @ 70° F.: 69.78
Rvp @ 100° F., psi: 5.5
Salt lb/1,000 bbl: 15.0
Yield, NC_4 & lighter, vol %: 0.8
V/Ni, ppm: 1.7/5.8

Gasoline
Range, °F.: 60—200
Yield, vol %: 4.5
Total sulfur, wt %: <0.001
RON, clear (calc.): 73.6

Naphtha
Range, °F.: 200—300
Yield, vol %: 10.9
Total sulfur, wt %: 0.0049
Aniline pt, °F.: 118.5

Naphtha
Range, °F.: 300—400
Yield, vol %: 9.4
Paraffins, vol %: 43.42
Naphthenes, vol %: 48.19
Aromatics, vol %: 8.39
Total sulfur, wt %: 0.036
Aniline pt, °F.: 121.5
Smoke pt, mm: 25

Kerosine
Range, °F.: 400—500
Gravity, °API: 36.1
Vis., SUS @ 100° F.: 32.84
Freezing pt, °F.: −56
P/N/A, vol %: 26.3/50.9/22.8
Sulfur, wt %: 0.07
Aniline pt, °F.: 136.1
Smoke pt, mm: 19

Light gas oil
Range, °F.: 500—650
Yield, vol %: 17.1
Gravity, °API: 30.7
Vis., SUS @ 100° F.: 45.28
Pour pt, °F.: +10
P/N/A, vol %: 28.3/49.8/21.9
Total sulfur, wt %: 0.22
Aniline pt, °F.: 157.4

Vacuum gas oil
Range, °F.: 620—1,000
Yield, vol %: 25.7
Gravity, °API: 23.3
Aniline pt, °F.: 192.1
Vis., SUS @ 130° F.: 152.01
Pour pt, °F.: +90
Sulfur, wt %: 0.39
Rams. carbon res., wt %: 0.15
V/Ni, ppm: 0.1/0.2
Nitrogen, wt %: 0.086

Residue
Range, °F.: 650+
Yield, vol %: 42.9
Vis., SUS @ 210° F.: 125.43
Pour pt, °F.: +80
Total sulfur, wt %: 0.565
Rams. carbon res., wt %: 3.69
Nitrogen, wt %: 0.225
V/Ni, ppm: 3.8/12.6

Forcados Blend, Nigeria

CALMS some 7 miles off coast

Crude
Gravity, °API: 29.7
Sulfur, wt %: 0.29
Pour pt, °C.: −20
Kin. vis., cSt @ 10° C.: 10.6
C_4 & lighter: 0.7

Light naphtha
Range, °C.: C_5—65
Yield, wt %: 1.4
Density @ 15° C., g/cu cm: 0.650
RON + 0.4 g Pb/l: 87.5

Heavy naphtha
Range, °C.: 65—175
Yield, wt %: 12.3
Density @ 15° C., g/cu cm: 0.765
RON + 0.4 g Pb/l: 75
Aromatics, vol %: 12.0
Naphthenes, vol %: 53

Kerosine
Range, °C.: 175—225
Yield, wt %: 9.0
Density @ 15° C., g/cu cm: 0.830
Sulfur, wt %: 0.04

Gas oil
Range, °C.: 225—360
Yield, wt %: 37.8
Density @ 15° C., g/cu cm: 0.880
Sulfur, wt %: 0.18
Pour pt, °C.: −17
Cold filter pour pt, °C.: −15
Kin. vis., cSt @ 100° C.: 1.46

Heavy gas oil
Range, °C.: 360—525
Yield, wt %: 28.6
Density @ 15° C.: 0.941
Sulfur, wt %: 0.40
Kin. vis., cSt @ 100° C.: 10.6

Residue
Range, °C.: 360+
Yield, wt %: 38.8
Density @ 15° C.: 0.953
Sulfur, wt %: 0.56
Kin. vis., cSt @ 100° C.: 22.1

Gamba, Gabon

Buoy 6 km offshore from Gamba tank farm

Crude
Gravity, °API: 31.8
Vis., cSt @ 37.8° C.: 36.7
Pour pt, °C.: +23
Total sulfur, wt %: 0.11
Con. carbon, wt %: 3.10
UOP charac. factor: 12.20
Yield C_1—C_5, vol %: 1.42

Gasoline
Range, °C.: C_5—80
Yield, vol %: 1.3
Rvp, psi, g/sq cm: 800
RON, clear: 90
Sulfur, wt %: 0.0036

Heavy naphtha
Range, °C.: 80—160
Yield, vol %: 4.9
Density @ 15/4 °C.: 0.753
Paraffins, vol %: 46.9
Naphthenes, vol %: 50.6
Aromatics, vol %: 2.5
Sulfur, wt %: 0.0069

Kerosine
Range, °C.: 160—250
Yield, vol %: 11.8
Density @ 15/4 °C.: 0.808
Freezing pt, °C.: −52
Smoke pt, mm: 23
Sulfur, wt %: 0.014
Aniline pt, °C.: 64.2
Aromatics, vol %: 14.0

Gas oil
Range, °C.: 250—350
Yield, vol %: 19.3
Density @ 15/4 °C.: 0.838
Pour pt, °C.: −14
Cloud pt, °C.: −11
Vis., °Engler @ 20° C.: 1.58
Cetane index: 53
Sulfur, wt %: 0.057
Diesel index: 66
Aniline pt, °C.: 80.4

Residue
Range, °C.: +350
Yield, vol %: 62.0
Density @ 15/4 °C.: 0.900
Pour pt., °C.: +45
Vis., °Engler @ 50° C.: 18.9
Sulfur, wt %: 0.16

Kole Marine Blend, Cameroon

CALM with floating storage in offshore producing area

Crude
Gravity, °API: 34.89
Vis., cSt @ 10° C.: 11.1
Pour pt, °C.: −6
Total sulfur, wt %: 0.30
Rvp @ 37.8° C., g/sq cm: 445
Paraffins, wt %: 6.2
Con. carbon, wt %: 3.65
UOP charac. factor: 11.9
V/Ni, kg/mg: 9/27
C_1—C_5, yield, vol %: 6.12

Light gasoline
Range, °C.: 15—80
Yield, vol %: 5.71
RON, clear: 76.2

Heavy naphtha
Range, °C.: 80—180
Yield, vol %: 21.89
Density, 15/4 °C.: 0.765
Paraffins, vol %: 38.5
Naphthenes, vol %: 53.3
Aromatics, vol %: 8.2
Sulfur, wt %: 0.0080

Kerosine
Range, °C.: 180—225
Yield, vol %: 8.21
Density @ 15/4 °C.: 0.819
Freeze pt, °C.: −63
Smoke pt, mm: 20
Sulfur, wt %: 0.0467
Aromatics, vol %: 13.4

Gas oil
Range, °C.: 150—400
Yield, vol %: 43.89
Density @ 15/4 °C.: 0.839
Pour pt, °C.: −9
Vis., cSt @ 50° C.: 2.6
Cetane index: 52.0
Sulfur, wt %: 0.16

Gas oil
Range, °C.: 180—350
Yield, vol %: 30.46
Density @ 15/4 °C.: 0.838
Pour pt, °C.: −22
Sulfur, wt %: 0.15

Residue
Range, °C.: 350+
Yield, vol %: 38.91
Density @ 15/4 °C.: 0.947
V/Ni, ppm: 20/68
Pour pt, °C.: +33
Vis. @ 50° C.: 425
Ash, wt %: 0.05
Sulfur, wt %: 0.54

Lucina Marine, Gabon

CALM with floating storage in offshore producing area

Crude
Gravity, °API: 39.52
Vis., cSt @ 20° C.: 16.00
Pour pt, °C.: +15
Rvp @ 37.8° C., g/sq cm: 450
Total sulfur, wt %: 0.05
Asphaltenes, wt %: 0.06
UOP charac. factor: 12.25
V/Ni, kg/mg: 1.3/12.2

Gasoline
Range, °C.: C_5—80
Yield, vol %: 5.56
Rvp, g/sq cm: 698
RON, clear: 66.3

Heavy gasoline
Range, °C.: 80—150
Yield, vol %: 13.46
Paraffins, vol %: 54.3
Naphthenes, vol %: 37.8
Aromatics, vol %: 7.9
Sulfur, wt %: 0.005

Kerosine
Range, °C.: 150—225
Yield, vol %: 14.38
Density @ 15/4 °C.: 0.778
Freeze pt, °C.: −55
Vis., cSt @ 34.4° C.: 5.07
Smoke pt, mm: 21
Sulfur, wt %: 0.006
Aromatics, vol %: 10.6

Gas oil
Range, °C.: 150—350
Yield, vol %: 38.59
Density @ 15/4 °C.: 0.809
Pour pt, °C.: −18
Vis., °Engler @ 50° C.: 1.78
Cetane index: 60.0
Diesel index: 71.8
Sulfur, wt %; 0.010
Aniline pt, °C.: 74.2

Residue
Range, °C.: 350+
Yield, vol %: 40.23
Density @ 15/4 °C.: 0.898
Pour pt, °C.: +36
Vis., cSt @ 50° C.: 86.4
Sulfur, wt %: 0.060
Asphaltenes, wt %: 0.08
Con. carbon, wt %: 2.96
V, ppm: 3

Mandji, Gabon

Cap Lopez terminal, loading berth, Prince's Bay

Crude
Gravity, °API: 30.5
Vis., cSt @ 10° C.,: 44.0
Pour pt, °C.: +3
Rvp @ 37.8° C., g/sq cm: 270
Total sulfur, wt %: 1.10
Asphaltenes, wt %: 0.3
Con. carbon, wt %: 5.40
UOP charac. factor: 12.1
V/Ni, kg/mg: 48/50
C_1—C_5, yield, vol %: 4.46

Gasoline
Range, °C.: 15—80
Yield, vol %: 5.38
RON, clear: 74.2

Heavy naphtha
Range, °C.: 80—150
Yield, vol %: 9.63
Paraffins, vol %: 55.2
Naphthenes, vol %: 36.7
Aromatics, vol %: 8.1
Sulfur, wt %: 0.006

Kerosine
Range, °C.: 150—225
Yield, vol %: 10.37
Density @ 15/4 °C.: 0.795
Freeze pt, °C.: −53
Smoke pt, mm: 24
Sulfur, wt %: 0.101
Aromatics, vol %: 17.3
Aniline pt, °C.: 56.1

Gas oil
Range, °C.: 150—375
Yield, vol %: 36.12
Density @ 15/4 °C.: 0.839
Pour pt, °C.: −15
Vis., cSt @ 50° C.: 2.28
Cetane index: 55.1
Diesel index: 59.7
Sulfur, wt %: 0.4
Aniline pt, °C.: 69.3

Heavy gas oil
Range, °C.: 375—525
Yield, vol %: 23.10
Density @ 15/4 °C.: 0.909
Pour pt, °C.: +37
Vis., cSt @ 50° C.: 50
Nitrogen, ppm: 480
Aniline pt, °C.: 85.4
Ni, ppm: <1
Sulfur, wt %: 1.14
Con. carbon, wt %: 0.45

Residue
Range, °C.: 375+
Yield, vol %: 46.96
Density @ 15/4 °C.: 0.952
V/Ni, ppm: 93/98
Pour pt, °C.: +36
Vis., cSt @ 50° C.: 2,100
Sulfur, wt %: 1.81
Asphaltenes, wt %: 0.49
Con. carbon, wt %: 10.2

Pennington, Nigeria

CALM with export from floating storage in offshore producing area

Crude
Gravity, °API: 36.6
Sulfur, wt %: 0.07

Vis., cSt @ 104° F.: 3.06
Pour pt, °F.: 43
C_4 & lighter, vol %: 1.5
Rvp @ 100° F., psi: 5.1
Con. carbon residue, wt %: 0.7
V/Ni, ppm: 2/1

Light naphtha
Range, °F.: C_5—200
Yield, vol %: 7.4
Sulfur, wt %: 0.001
Paraffins, vol %: 70.5
Naphthenes, vol %: 25.5
Aromatics, vol %: 3.5
RON, clear: 74.9

Heavy naphtha
Range, °F.: 200—340
Yield, vol %: 14.7
Sulfur, wt %: 0.001
P/N/A, vol %: 35.0/52.5/12.0
RON, clear: 55.5
Aniline pt, °F.: 118

Kerosine
Range, °F.: 340—470
Yield, vol %: 18.0
Gravity, °API: 40.6
Sulfur, wt %: 0.02
Vis., cSt @ 104° F.: 1.45
Smoke pt, mm: 19.5
Freeze pt, °F.: −69
Aniline pt, °F.: 135
Cloud pt, °F. < −76

Gas oil
Range, °F.: 470—650
Yield, vol %: 31.7
Gravity, °API: 33.7
Sulfur, wt %: 0.05
Vis., cSt @ 104° F.: 3.72
Pour pt, °F. −1.0
Aniline pt, °F.: 158
Cloud pt, °F.: 6.0

Vacuum gas oil
Range, °F.: 650—1,000
Yield, vol %: 23.4
Gravity, °API: 23.5
Sulfur, wt %: 0.15
Vis., cSt @ 122° F.: 28.9
Pour pt, °F.: 102
Aniline pt, °F.: 184
Con. carbon residue, wt %: 0.12
V/Ni, ppm: 2/<1

Residue
Range, °F.: 650+
Yield, vol %: 26.7
Gravity, °API: 21.8
Sulfur, wt %: 0.17
Vis., cSt @ 122° F.: 48.5
Pour pt, °F.: 91
Aniline pt, °F.: 179
Con. carbon residue, wt %: 2.3

Qua Iboe, Nigeria

CALM in offshore producing area

Crude
Gravity, °API: 35.8
Pour pt, °F.: 45
Kin. vis., cSt @ 59° F.: 6.76
  @ 104° F.: 3.39
Con. carbon residue, wt %: 0.92
Aniline pt, °C.: 62.56
Sulfur, wt %: 0.12
Rvp, psi: 6.0
Nitrogen, total, ppm: 540
V/Ni, ppm: 0.3/3.3
C_5 & lighter, yield, vol %: 5.13

Light naphtha
Range (TBP), °F.: 60—180
Yield, vol %: 5.15
Rvp, psi: 10.3
Paraffins, vol %: 67.3
Naphthenes, vol %: 31.6
Aromatics, vol %: 1.1
Sulfur, wt %: 0.0008

Heavy naphtha
Range, °F.: 180—380
Yield, vol %: 25.14
Rvp, psi: 1.0
P/N/A, vol %: 34.6/55.3/10.1
RON, clear: 56.6
RON + 3 ml TEL/gal: 76.0
Sulfur, wt %: 0.026

Kerosine
Range, °F.: 330—444
Yield, vol %: 13.64
Gravity, °API: 41.2
P/N/A, vol %: 36.4/49.3/14.3
Freezing pt, °F.: −50
Smoke pt, mm: 20
Aniline pt, °F.: 132.1
Diesel index: 54
Cetane index: 39
Sulfur, wt %: 0.05

Light gas oil
Range, °F.: 380—710
Yield, vol %: 42.63
Gravity, °API: 33.1
Pour pt, °F: 15
Aniline pt, °F.: 151.4
Sulfur, wt %: 0.11

Heavy gas oil
Range, °F.: 710—850
Yield, vol %: 12.18
Gravity, °API: 22.7
Pour pt, °F.: 95
Kin. vis., cSt @ 100° F.: 68.55
Aniline pt, °F.: 178.7
Diesel index: 41
Sulfur, wt %: 0.16
Nitrogen, total, ppm: 679
Con. carbon, wt %: 0.02

Residue
Range, °F.: 710+
Yield, vol %: 24.65
Gravity, °F.: 17.9
Pour pt, °F.: 110
Kin. vis., cSt @ 100° F.: 900.93
Sulfur, wt %: 0.23
Nitrogen, total, ppm: 1,604
Con. carbon residue, wt %: 3.36
V/Ni, ppm: 1.2/13.1

Salt Pond, Ghana

SALM with hawser-moored permanent storage in offshore producing area

Crude
Gravity, °API: 37.4
Sulfur, wt %: 0.097
C_1—C_3 yield, vol %: 0.37

Gasoline
Range, °F.: 115—180
Yield, vol %: 9.23
RON, clear: 57.0

Gasoline
Range, °F.: 180—220
Yield, vol %: 2.90
RON, clear: 51.0

Naphtha
Range, °F.: 220—250
Yield, vol %: 2.50
RON, clear: 46.5

Naphtha
Range, °F.: 250—320
Yield, vol %: 7.20

Heavy naphtha
Range, °F.: 320—360
Yield, vol %: 4.30
Aniline pt, °F.: 138

Kerosine
Range, °F.: 360—500
Yield, vol %: 16.30
Gravity, °API: 43.7
Pour pt, °F.: −36
Sulfur, wt %: 0.020
Aniline pt, °F.: 148

Gas oil
Range, °F.: 500—600
Yield, vol %: 10.90
Gravity, °API: 37.3
Pour pt, °F.: 11
Sulfur, wt %: 0.030
Aniline pt, °F.: 163

Gas oil
Range, °F.: 600—650
Yield, vol %: 5.10
Gravity, °API: 34.4
Pour pt, °F.: 38
Sulfur, wt %: 0.070
Aniline pt, °F.: 173

Heavy gas oil
Range, °F.: 650—940
Yield, vol %: 21.20
Gravity, °API: 27.9
Sulfur, wt %: 0.110
Nitrogen, %: 0.0300

Vacuum bottoms
Range, °F.: 940+
Yield, vol %: 20.00
Gravity, °API: 17.6
Sulfur, wt %: 0.250
K factor: 11.89
Vis., Sfs @ 210° F.: 263.0

Soyo Blend, Angola

Quinfequena terminal

Crude
Gravity, °API: 33.7
Sulfur, wt %: 0.23
Pour pt, °C.: +18
Vis., cSt @ 37.8° C.: 10.08
Asphaltenes, wt %: 0.72
Total acidity, mg KOH/g: 0.07
Wax content, wt % @ —30° C.: 14.7
V/Ni, ppm: 5/15
C_1—C_5 (GLC), yield, wt %: 2.33

Gasoline
Range (TBP), °C.: C_5—80
Yield, vol %: 3.86
RON + 0.4 g TEL/l: 83.7

Heavy naphtha
Range, °C.: 80—150
Yield, vol %: 9.63
Density @ 15° C.: 0.745
Naphthenes, vol %: 37.2
Aromatics, vol %: 10

Kerosine
Range, °C.: 150—230
Density @ 15° C.: 0.793
Sulfur, wt %: 0.021
Freeze pt, °C.: −53
Aromatics, vol %: 16
Smoke pt, mm: 25
Naphthenic acids, ppm: 68

Gas oil
Range, °C.: 230—340
Yield, vol %: 19.99
Density @ 15° C.: 0.838

Sulfur, wt %: 0.12
Cloud pt, °C.: −8
Cetane index: 53.0
Vis., cSt @ 50° C.: 2.73

Heavy gas oil
Range, °C.: 340—510
Yield, vol %: 26.22
Density @ 15° C.: 0.8824
Sulfur, wt %: 0.24
Aniline pt, °C.: 94.0
Basic nitrogen, ppm: 298
Total nitrogen, wt %: 0.10
Con. carbon, wt %: 0.01
V/Ni, ppm: <2/<2

Residue
Range, °C.: 340+
Yield, vol %: 52.16
Density @ 15° C.: 0.920
Sulfur, wt %: 0.21
Vis., cSt @ 50° C.: 160.8
Con. carbon, wt %: 5.5

Zaire, Zaire

CALM with moored storage in offshore producing area

Crude
Gravity, °API: 31.7
Sulfur, wt %: 0.13
Vis., SUS @ 100° F.: 98.0
Pour pt, °F.: +80
C_4 & lighter, vol %: 1.00
Rvp, lb: 2.2
V/Ni, ppm: 1.5/17.8
Salt, lb/1,000 bbl: 6
ASTM, 50% pt, °F.: >590

Light naphtha
Range (TBP), °F.: Ibp—140*
Yield, vol %: 1.84
Sulfur, wt %: 0.037
RON, clear: 79.4

Light naphtha
Range, °F.: 140—170
Yield, vol %: 1.03
Sulfur, wt %: 0.020
Paraffins, vol %: 76.5
Naphthenes, vol %: 22.2
Aromatics, vol %: 1.3
RON, clear: 65.7

Heavy naphtha
Range, °F.: 170—310
Yield, vol %: 8.84
Sulfur, wt %: 0.006
P/N/A, vol %: 53.8/41.6/4.6
Aniline pt, °F.: 133.5

Kerosine
Range, °F.: 310—520
Yield, vol %: 16.31
Sulfur, wt %: 0.074
Freezing pt, °F.: −36
Aniline pt, °F.: 147
Cetane index: 50.0
Smoke pt, mm: 27

Light gas oil
Range, °F.: 520—680
Yield, vol %: 15.44
Vis., SUS @ 100° F.: 45.0
Sulfur, wt %: 0.14
Pour pt, °F.: +45
Diesel index: 62.4
Cetane index: 62.0

Heavy gas oil
Range (TBP to EFV), °F.: 680—1,000
Yield, vol %: 31.39
Gravity, °API: 26.7
Vis., SUS @ 210° F.: 54.0
Sulfur, wt %: 0.12
Total nitrogen, ppm: 1,010
Pour pt, °F.: +115
Aniline pt, °F.: 214.3
V/Ni, ppm: 0.1/0.3

Residual oil
Range, °F.: 680+
Yield, vol %: 55.65
Gravity, °API: 21.4
Vis., SUS @ 210° F.: 181.9
Sulfur, wt %: 0.17
Con. carbon res., wt %: 6.03
Pour pt, °F.: +100
V/Ni, ppm: 2.5/30
*Does not include C_4 and lighter

North Africa

Amna (high pour), Libya

Ras Lanuf/CBMs & SPM

Crude
Gravity, °API: 36.1
Sulfur, wt %: 0.15
Pour pt, °F.: 75
Kin. vis., cSt @ 37.8° C.: 13.70
Car. residue (CCR), wt %: 3.7
Rvp, psi: 3.9
Salt, lb/1,000 bbl: 8.2
V/Ni, ppm: 0.6/5.0
Ibp-60° F., yield, vol %: 2.11

Light naphtha
Range, °F.: 60-120
Yield, vol %: 2.4
Gravity, °API: 93.6
Sulfur, wt %: 0.01
Paraffins, vol %: 99.0
Naphthenes, vol %: 1.0
RON, clear: 78.0
RON + 3 ml TEL: 94.0

Light naphtha
Range, °F.: 120-250
Yield, vol %: 7.7
Gravity, °API: 69.5
Sulfur, wt %: 0.01
Paraffins, vol %: 69.9
Naphthenes, vol %: 26.5
Aromatics, vol %: 3.7

Heavy naphtha
Range, °F.: 250-330
Yield, vol %: 6.9
Gravity, °API: 57.4
Sulfur, wt %: 0.02
P/N/A, vol %: 60.5/33.6/5.9

Kerosine
Range, °F.: 330-443
Yield, vol %: 9.4
Gravity, °API: 49.9
Sulfur, wt %: 0.05
P/N/A, vol %: 60.9/29.9/9.2
Pour pt, °F.: −75
Freezing pt, °F.: −58
Aniline pt, °F.: 150.6
Diesel index: 75
Smoke pt, mm: 31

Gas oil
Range, °F.: 443-600
Yield, vol %: 15.0
Gravity, °API: 42.3
Sulfur, wt %: 0.07
Pour pt, °F.: 0
Aniline pt, °F.: 169.1
Diesel index: 71

Gas oil
Range, °F.: 600-850
Yield, vol %: 23.3
Sulfur, wt %: 0.13
Pour pt, °F.: 80
Aniline pt, °F.: 202.0
Diesel index: 69

Residual oil
Range, °F.: 655+
Yield, vol %: 55.4
Gravity, °API: 25.4
Sulfur, wt %: 0.22
Pour pt, °F.: 100
Car. residue CCR, wt %: 6.22
V/Ni, ppm: 1.1/8.5

Residual oil
Range, °F.: 1,000+
Yield, vol %: 21.8
Gravity, °API: 16.7
Sulfur, wt %: 0.31
Pour pt, °F.: 130
Car. residue CCR, wt %: 14.50
V/Ni, ppm: 2.5/20.0

Ashtart, Tunisia

Floating storage barge in Gulf of Gabes producing area

Crude
Gravity, °API: 29.03
Vis. @ 20° C., cSt: 24.0
Pour pt, °C.: +9
Rvp @ 38.7° C., g/sq cm: 130
Total sulfur, wt %: 1.0
Paraffins/Asphaltenes, wt %: 11.0/1.8
Con. carbon, wt %: 5.4
$>C_1$-C_5, vol %: 1.26
V/Ni, mg/kg: 20/9

Light naphtha
Range (TBP), °C.: 15-100
Yield, vol %: 5.65
Density, 15/4 °C.: 0.702
Rvp, g/sq cm: 500
RON, clear: 63.6
Aromatics, vol %: 10.0

Heavy naphtha
Range (TBP), °C.: 100-145
Yield, vol %: 6.42
Density, 15/4 °C.: 0.759
Paraffins, vol %: 47.2
Naphthenes, vol %: 37.8
Aromatics, vol %: 15.0
Sulfur, wt %: 0.0055

Heavy naphtha
Range (TBP), °C.: 145-180
Yield, vol %: 5.91
Density, 15/4 °C.: 0.785
P/N/A, vol %: 46.5/33.8/19.7
Sulfur, wt %: 0.0120

Kerosine
Range (TBP), °C.: 180-225
Yield, vol %: 6.65
Density, 15/4 °C.: 0.812
Freeze pt, °C.: −54
Vis., cSt @ 50° C.: 1.10
Smoke pt, mm: 21
Sulfur, wt %: 0.04
Aniline pt, °C.: 54.0
Aromatics, vol %: 18.9

Gas oil
Range (TBP), °C.: 145-350
Yield, vol %: 36.04
Density, 15/4 °C.: 0.834
Pour pt, °C.: −21
Cloud pt, °C.: −16
Filterability, °C.: −19
Vis, cSt @ 50° C.: 1.9
Cetane index: 48.8
Sulfur, wt %: 0.44
Diesel index: 54.7
Aniline pt, °C.: 62.0
Con. carbon @ 10%, wt %: <0.05

Residue
Range (TBP), °C.: 350+
Yield, vol %: 51.90
Density, 15/4 °C.: 0.943
Pour pt, °C.: +18
Vis. cSt, @ 50° C.: 225
Sulfur, wt %: 1.42
Con. carbon, wt %: 9.4
V/Ni, ppm: 34/17
N, wt %: 0.40

Brega, Libya

Marsa el Brega/ CBM, SPM, SBM

Crude
Gravity, °API: 40.4
Sulfur, wt %: 0.21
Pour pt, °F.: +30
Rvp, psi: 6.4
Kin., cSt @ 70° F.: 5.58
@ 100° F.: 3.56

Light naphtha
Range, °F.: 68-212
Yield, vol %: 12.4
Gravity, °API: 73.8
Sulfur, wt %: 0.014
Rvp, psi: 7.4
Paraffins, vol %: 72.5
Naphthenes, vol %: 25.3
Aromatics, vol %: 2.2
RON, clear: 65.1

Heavy naphtha
Range, °F.: 212-302
Yield, vol %: 10.7
Gravity, °API: 56.8
Sulfur, wt %: 0.020
P/N/A, vol %: 53.1/39.4/7.5

Kerosine
Range, °F.: 302-455
Yield, vol %: 17.4
Gravity, °API: 46.7
Sulfur, wt %: 0.035
P/N/A, vol %: 51.2/34.7/14.1
Freeze pt, °F.: −70
Smoke pt, mm: 27
Luminometer no.: 61
Aniline pt, °F.: 144
Kin. vis., cSt @ 30° F.: 5.50
@ 100° F.: 1.17

Light gas oil
Range, °F.: 455-650
Yield, vol %: 20.3
Gravity, °API: 38.1
Sulfur, wt %: 0.10
Pour pt, °F.: +15
Aniline pt, °F.: 172
Kin. vis., cSt @ 100° F.: 3.61

Heavy gas oil
Range, °F.: 650-1,049
Yield, vol %: 27.8
Gravity, °API: 27.7
Sulfur, wt %: 0.30
Pour pt, °F.: 105
Aniline pt, °F.: 206
Kin. vis., cSt @ 150° F.: 14.9

Residual oil
Range, °F.: 650+
Yield, vol %: 36.8
Gravity, °API: 23.6
Sulfur, wt %: 0.41
Pour pt, °F.: 95
Con. carbon wt %: 4.1
Kin. vis., cSt @ 100° F.: 184
@ 122° F.: 92.0

Residual oil
Range, °F.: 1,049+
Yield, vol %: 9.0
Gravity, °API: 12.3
Sulfur, wt %: 0.69
Pour pt, °F.: >120
Con. carbon, wt %: 14.6
Kin. vis., cSt @ 210° F.: 620
V/Ni/Fe, ppm: 24/32/124

Bu Attifel, Libya

Zueitina/CBM & SBM

Crude
Gravity, °API: 43.6
Rvp, psi: 0
Sulfur, wt %: 0.034
Pour pt, °F.: +90

Light ends
Range vapor temp., °F.: Ibp-160
Yield, vol %: 2.5

Light naphtha
Range, vapor temp., °F.: 160-290
Yield, vol %: 9.0
Gravity, °API: 62.5
Paraffins, vol %: 75.4
Olefins, vol %: 0.4
Naphthenes, vol %: 18.3
Aromatics, vol %: 5.9

Heavy naphtha
Range, VT, °F.: 290-390
Yield, vol %: 9.0
Gravity, °API: 56.8
Sulfur, wt %: 0.0015
P/O/N/A, vol %: 75.7/0.4/17.8/6.1

Kerosine
Range, VT, °F.: 390-500
Yield, vol %: 11.7
Gravity, °API: 50.3
Sulfur, wt %: 0.005
Aromatics, vol %: 5.6
Smoke pt, mm: 22
Freeze pt, °F.: 9.4
Pour pt, °F.: −10

Diesel
Range, VT, °F.: 500-635
Yield, vol %: 11.3
Gravity, °API: 44.0
Sulfur, wt %: 0.0140
Vis., SSU @ 100° F.: 38.4
Aniline pt, °F.: 192.5
Diesel index: 84.7
Pour pt, °F.: 45

Lt. gas oil
Range, VT, °F.: 635-775
Yield, vol %: 20.7
Gravity, °API: 41.6
Sulfur, wt %: 0.03
Vis., SSU @ 100° F.: 49.5
Pour pt, °F.: +85
UOP "K" factor: 12.6

Heavy gas oil
Range, VT, °F.: 775-932
Yield, vol %: 20.6
Gravity, °API: 37.4
Sulfur, wt %: 0.04
Vis., SSF @ 210° F.: 41.6
Pour pt, °F.: +125
UOP "K" factor: 12.8

Residue
Range, °F.: 932+
Yield, vol %: 15.2
Gravity, °API: 29.2
Sulfur, wt %: 0.10
Carbon residue, wt %: 1.5

El Borma, Tunisia

La Skhirra, Tunisia

Crude
See Algerian Zarzaitine assay. One blend has two names.

Es Sider, Libya

Es Sider/3 CBMs, 1 SBM

Crude
Gravity, °API: 36.7
Kin. vis., cSt @ 100° F.: 5.26
Con. carbon residue, wt %: 1.8
Sulfur, wt %: 0.37
V/Ni, ppm: 1.5/5.6
Pour pt, °C.: +7.2
Rvp, psi: 6.3
C_4 & lighter, vol %: 2.3

Naphtha
Range (TBP), °F.: 82-342
Yield, vol %: 22.2
Gravity, °API: 64.8
Paraffins, vol %: 57.8
Naphthenes, vol %: 36.5
Sulfur, wt %: 0.03

Kerosine
Range (TBP), °F.: 342-472
Yield, vol %: 11.3
Gravity, °API: 46.3
Sulfur, wt %: 0.13
Aromatics, vol %: 13

Heavy distillate
Range (TBP), °F.: 472-705
Yield, vol %: 28.0
Gravity, °API: 35.7
Sulfur, wt %: 0.31

Gas oil
Range (TBP), °F.: 705-980
Yield, vol %: 20.3
Gravity, °API: 25.5
Sulfur, wt %: 0.48

Residue
Range (TBP), °F.: 980+
Yield, vol %: 15.9
Gravity, °API: 12.3
Sulfur, wt %: 1.16
Kin. vis., cSt @ 210° F.: 500
Con. carbon residue, wt %: 14.7
V/Ni, ppm: 8/30

Saharan Blend,* Algeria

Arzew (3 CBMs)
Bejaia (4 jetties)
Skikda

Crude
Gravity, °API: 45.5 (43.7)
Rvp, psi: 8.7 (8.1)
Sulfur, wt %: 0.053 (0.090)
Pour pt, °F.: <−20 (<−20)
Vis. SSU @ 70° F.: 37.3 (40.1)

Light ends
Range, vapor temp., °F.: Ibp-160
Yield, vol %: 10.4 (9.9)

Light naphtha
Range, vapor temp., °F.: 160-290
Yield, vol %: 18.3 (14.9)
Gravity, °API: 64.0 (63.7)
Paraffins, vol %: 70.8 (70.2)
Olefins, vol %: 0.3 (0.4)
Naphthenes, vol %: 21.8 (23.4)
Aromatics, vol %: 7.1 (6.0)

Heavy naphtha
Range, VT, °F.: 290-390
Yield, vol %: 13.7 (14.5)
Gravity, °API: 53.3 (52.1)
P/O/N/A, vol %: 47.4/0.3/36.4/15.9 (55.0/0.3/29.6/15.1)

Kerosine
Range, VT, °F.: 390-500
Yield, vol %: 14.1 (13.4)
Gravity, °API: 44.6 (44.0)
Sulfur, wt %: 0.0056 (0.0030)
Aromatics, vol %: 15.8 (16.4)
Smoke pt, mm: 17 (21)
Freeze pt, °F.: −38.2 (−42.7)

Diesel
Range, VT, °F.: 500-635
Yield, vol %: 12.7 (12.8)
Gravity, °API: 36.6 (35.1)
Sulfur, wt %: 0.0571 (0.0736)
Vis. SSU @ 100° F.: 41.6 (40.3)
Pour pt, °F.: +15 (+5)
Aniline pt, °F.: 170 (165.5)
Diesel index: 62.2 (58.1)

Light gas oil
Range, VT, °F.: 635-775
Yield, vol %: 9.3 (14.3)
Gravity, °API: 31.1 (31.7)
Sulfur, wt %: 0.07 (0.13)
Vis. SSU @ 100° F.: 57.5 (63.0)
Pour pt, °F.: +50 (+40)

Heavy gas oil
Range, VT, °F.: 775-932
Yield, vol %: 12.0 (10.0)
Gravity, °API: 28.6 (26.5)
Sulfur, wt %: 0.10 (0.18)
Vis., SSU @ 210° F.: 49.6 (54.5)
Pour pt, °F.: +90 (+90)
Carbon residue, wt %: 0.05 (0.06)

Residue
Range, VT, °F.: 932+
Yield, vol %: 9.5 (10.2)
Gravity, °API: 21.2 (19.9)
Sulfur, wt %: 0.22 (0.28)
Vis., SSF, @ 210° F.: 38.0 (45.1)
Carbon residue, wt %: 6.8 (7.4)

*Gravity of Saharan Blend has not been consistent. Values in parenthesis are those for 43.7 °API blend.

Sarir, Libya

Marsa al Hariga (Tobruk)/CBM

Crude
Gravity, °API: 38.3
Sulfur, wt %: 0.18
Pour pt, °F.: 25
Kin. vis. cSt @ 50° C.: 4.73
Yield, C_2-C_4, vol %: 3.82
V/Ni, ppm: 6/14

Naphtha
Range, °C.: Ibp-180
Yield, vol %: 22.89
Total sulfur, ppm: 14
Paraffins, vol %: 60.8
Naphthenes, vol %: 35.8
Aromatics, vol %: 3.4

Kerosine
Range, °C.: 180-250
Yield, vol %: 11.27
Total sulfur, ppm: 83
Smoke pt, mm: 30

Gas oil
Range, °C.: 250-320
Yield, vol %: 10.99
Total sulfur, wt %: 0.063
Pour pt, °C.: −6
Aniline pt, °C.: 80

Resid
Range, °C.: 320+
Yield, vol %: 51.41
Total sulfur, wt %: 0.24
Vis. cSt @ 60° C.: 49
Con. carbon, wt %: 6.8

Resid
Range, °C.: 550+
Yield, vol %: 17.25
Total sulfur, wt %: 0.35
Con. carbon, wt %: 20
Asphaltenes, wt %: 4.7

Sirtica, Libya

Ras Lanuf/CBMs & SBM

Crude
Gravity, °API: 43.3
Total sulfur, wt %: 0.43
Pour pt, °C.: −3
Yield C_2-C_4, wt %: 3.24
Rvp, psi: 10.1

Condensate
Yield, vol %: 42

Naphtha
Range, °C.: Ibp-180
Yield, vol %: 39.7
Gravity, °API: 62.8
Total sulfur, wt %: 0.015
P/N/A, vol %: 69.7/22.8/7.5

Gas oil
Range, °C.: 180-350
Yield, vol %: 29.8
Gravity, °API: 38.7
Total sulfur, wt %: .21
Pour pt, °C.: −15

Resid
Range, °C.: 350+
Yield, vol %: 25.5
Gravity, °API: 19.1
Total sulfur, wt %: 1.16
Vis. cSt @ 180° F.: 39.0
Pour pt, °C.: 39
Con. carbon, wt %: 5.7

Zarzaitine, Algeria

La Skhirra, Tunisia

Crude
Gravity, °API: 43.0
Vis. cSt @ 10° C.: 6.90
Pour pt, °C.: −12
Rvp @ 37.8° C., g/sq cm: 603
Total sulfur, wt %: 0.07
Paraffins, wt %: 4.89
Con. carbon, wt %: 0.90
V/Ni, mg/kg: 1/3
Yield C_1-C_5, vol %: 7.31

Light naphtha
Range, °C.: C_5-80
Yield, vol %: 8.94
Density, 15/4 °C.: 0.662
RON, clear: 68.8
MON, clear: 64.6
Aromatics, vol %: 0.9

Heavy naphtha
Range, °C.: 80-145
Yield, vol %: 15.13
Density, 15/4 °C.: 0.738
Paraffins, vol %: 59.4
Naphthenes, vol %: 33.9
Aromatics, vol %: 6.7
Sulfur, wt %: 0.0138

Kerosine
Range, °C.: 145-225
Yield, vol %: 16.58
Density, 15/4 °C.: 0.784
Freeze pt, °C.: −65
Vis. cSt @ 34.4° C.: 4.50
Smoke pt, mm: 25
Sulfur, wt %: 0.0162
Aromatics, vol %: 14.2

Gas oil
Range, °C.: 225-290
Yield, vol %: 12.55
Density, 15/4 °C.: 0.822
Pour pt, °C.: −36
Cloud pt, °C.: −27
Filterability, °C.: −34
Vis. cSt @ 50° C.: 1.95
Sulfur, wt %: 0.025

Gas oil
Range, °C.: 290-350
Yield, vol %: 10.89
Density, 15/4 °C.: 0.843
Pour pt, °C.: −3
Vis. cSt @ 50° C.: 4.18
Sulfur, wt%: 0.045

Residue
Range, °C.: 350+
Yield, vol %: 32.47
Pour pt, °C.: +21
Density, 15/4 °C.: 0.899
Vis., cSt @ 50° C.: 80
Sulfur, wt %: 0.155
Asphaltenes, wt %: 0.21
Con. carbon, wt %: 2.48
V, ppm: 2.5

Zueitina, Libya

Zueitina/CBMs & SBM

Crude
Gravity, °API: 41.3
Rvp, psi: 4.6
Sulfur, wt %: 0.28
Pour pt, °F.: 45
Vis. SSU @ 60° F.: 199.1

Light ends
Range, °F.: Ibp–113
Yield, vol %: 6.44

Light naphtha
Range, °F.: 113-220
Yield, vol %: 9.32
Gravity, °API: 66.9
Paraffins, vol %: 65.5
Naphthenes, vol %: 30.9
Aromatics, vol %: 3.6

Naphtha
Range, °F.: 220-390
Yield, vol %: 21.42
Gravity, °API: 53.9
Sulfur, wt %: 0.04
P/N/A, vol %: 59.2/27.0/10.2

Kerosine
Range, °F.: 315-500
Yield, vol %: 21.65

Gravity, °API: 45.6
Total sulfur, wt %: 0.11
Aromatics, vol %: 14.0
Smoke pt, mm: 27
Freeze pt, °F.: −36
Pour pt, °F.: −45

Light distillate
Range, °F.: 390-550
Yield, vol %: 18.16
Gravity, °API: 41.7
Cetane index: 53.0
Total sulfur, wt %: 0.17
Aniline pt, °F.: 159.0
Pour pt, °F.: −10

Light gas oil
Range, °F.: 450-650
Yield, vol %: 21.17
Gravity, °API: 38.4
Cetane index: 57.8
Total sulfur, wt %: 0.24
Total nitrogen, ppm: 78
Aniline pt, °F.: 173.0
Pour pt, °F.: 25

Heavy gas oil
Range, °F.: 650-1,000
Yield, vol %: 24.09
Gravity, °API: 29.1
Sulfur, wt %: 0.36
Total nitrogen, ppm: 922
Pour pt, °F.: 100
Carbon residue, wt %: 0.18

Vacuum flashed resid
Range, °F.: 1,000+
Yield, vol %: 10.11
Gravity, °API: 13.5
Total sulfur, wt %: 0.90

Asia

Ardjuna, Indonesia

SBM 18.5 miles off north coast of Java in producing area

Crude
Gravity, °API: 35.2
Sulfur, wt %: 0.105
Pour pt, °F.: 75
Rvp, lb: 5.3
Kin. vis. @ 100° F.: 3.738
Carbon residue, wt %: 1.38
V/Ni, ppm: <1/3
Nitrogen, ppm: 280
Yield, C_4 & lighter, vol %: 2.6

Naphtha
Range (TBP), °F.: C_5—150
Yield, vol %: 5.0
Sulfur, wt %: 0.005
RON, clear: 76.6
RON + 0.5 g TEL/gal: 82.7
MON, clear: 74.8

Heavy naphtha
Range, °F.: 150-380
Yield, vol %: 27.2
Gravity, °API: 50.8
Sulfur, wt %: 0.012
Paraffins, vol %: 34.3
Naphthenes, vol %: 46.0
Aromatics, vol %: 19.7
RON, clear: 64.6
MON, clear: 63.0

Distillate
Range, °F.: 380-520
Yield, vol %: 16.4
Gravity, °API: 33.0
Sulfur, wt %: 0.059
Pour pt, °F.: −65
Cetane no.: 36.3
Smoke pt, °F.: 12.5
Freezing pt, °F.: −39.5
Aromatics, vol %: 34.6
Total N, ppm: 4.0
Cloud pt, °F.: −46
Vis., cSt @ 100° F.: 1.967

Distillate
Range, °F.: 520-650
Yield, vol %: 14.0
Gravity, °API: 30.7
Sulfur, wt %: 0.099
Pour pt, °F.: −65
Cetane no.: 47.0
Total N, ppm: 33.0
Cloud pt, °F.: −26
Vis., cSt @ 100° F.: 4.689

Blended gas oil
Range, °F.: 650-840
Yield, vol %: 16.9
Gravity, °API: 25.1
Sulfur, wt %: 0.156
Aniline pt, °C.: 86.7
Pour pt, °F.: 90
Kin. vis. @ 210° F.: 3.983
Carbon residue, wt %: 0.02
Total nitrogen, ppm: 200

Residue
Range, °F.: 650+
Yield, vol %: 34.8
Gravity, °API: 21.1
Sulfur, wt %: 0.199
Carbon residue, %: 2.94
Total nitrogen, ppm: 670
Pour pt, °F.: 100
Kin. vis. @ 210° F.: 5.414

Vacuum residue
Range: Bottoms from vacuum flashed 650+ °F. resid @ 725° F.
Yield, vol %: 5.9
Gravity, °API: 5.1
Sulfur, wt %: 0.292
Carbon residue, wt %: 17.86
V/Ni, ppm: 7/30

Arimbi, Indonesia

Balongan sea terminal/SBM about 6.5 nautical miles off north coast of Java

Crude
Gravity, °API: 31.8
Sulfur, wt %: 0.204
Pour pt, °F.: 100
Vis., cSt @ 100° F.: 12.54
Carbon residue, wt %: 2.41
V/Ni, ppm: 0.9/2.6
Nitrogen, ppm: 531

Naphtha
Range (TBP), °F.: C_5—230
Yield, vol %: 10.6
Sulfur, wt %: <0.001
RON, clear: 64.6
RON + 0.5 g TEL/gal: 71.7

Naphtha
Range, °F.: 230-335
Yield, vol %: 11.2
Sulfur, wt %: 0.030
Total nitrogen, ppm: 1
Paraffins, vol %: 42.3
Naphthenes, vol %: 47.0
Aromatics, vol %: 10.7

Distillate
Range, °F.: 335-520
Yield, vol %: 17.3
Gravity, °API: 34.6
Sulfur, wt %: 0.107
Cetane no.: 37.3
Smoke pt, °F.: 14
Freezing pt, °F.: −32
Aromatics, vol %: 35.3

Distillate
Range, °F.: 520-650
Yield, vol %: 14.7
Gravity, °API: 31.6
Sulfur, wt %: 0.213
Pour pt, °F.: 45
Cetane no.: 50.2
Cloud pt, °F.: 50
Vis., cSt @ 100° F.: 5.450

Blended gas oil
Range, °F.: 650-840
Yield, vol %: 15.9
Gravity, °API: 29.0
Sulfur, wt %: 0.168
Aniline pt, °C.: 93.4
Pour pt, °F.: 110
Vis., cSt @ 210° F.: 4.385
Carbon residue, %: 0.008
Nitrogen, ppm: 266

Residue
Range, °F.: 650+
Yield, vol %: 45.9
Gravity, °API: 20.5
Sulfur, wt %: 0.240
Carbon residue, %: 5.27
Total nitrogen, ppm: 1,010
Pour pt, °F.: 120+
Vis. @ 210° F. (D2170): 22.29
V/Ni, ppm: 2.7/9.8

Attaka, Indonesia

Santan marine terminal about 80 miles north of Balikpapan, Kalimantan/SBM about 4 miles offshore

Crude
Gravity, °API: 42.3
Vis., cSt @ 70° F.: 1.7
Pour pt, °F.: −10
Rvp @ 100° F., psi: 6.8
Total acid no., Mg KOH/g: 0.20
Sulfur, wt %: 0.09
Wax, wt %: 4.22
Con. carbon residue, wt %: 0.34
Charac. factor, K UOP: 11.5

Naphtha
Range, °C.: C_5—100
Yield, vol %: 15.3
RON, clear: 74.9

Naphtha
Range, °C.: 100-150
Yield, vol %: 17.6
Paraffins, vol %: 41
Naphthenes, vol %: 35
Aromatics, vol %: 24.7

Kerosine
Range, °C.: 150-250
Yield, vol %: 29.6
Smoke pt, mm: 16
Freezing pt, °C.: −54

Gas oil
Range, °C.: 250-350
Yield, vol %: 25
Diesel index: 51
Cetane no.: 52.6

Fuel oil
Range, °C.: 350+
Yield, vol %: 12.5
Sulfur, wt %: 0.11
Pour pt, °F.: 100

Note: Attaka is mixed wtih Badak crude and other streams and shipped with Attaka specifications

Badak, Indonesia

Santan terminal about 80 miles north of Balikpapan, Kalimantan/SBM some 4 miles offshore

Crude
Gravity, °API: 41.3
Vis., cSt @ 100° F.: 5.72
Pour pt, °F.: −15
Rvp @ 100° F., psi: 5.6
Total acid number, mg KOH/g: 0.11
Sulfur, wt %: 0.08
Wax, wt %: 7.35
Con. carbon, wt %: 0.313
Charac. factor, K UOP: 12.5
Note: Badak is mixed with Attaka crude and shipped with Attaka specifications.

Bekapai, Indonesia

Senipah marine terminal about 27 miles northeast of Balikpapan, Kalimantan/SBM about 6 miles offshore

Crude
Gravity, °API: 40
Sulfur, wt %: 0.08
Pour pt, °C.: −21
Rvp, psi: 1.9
Vis.,cSt @ 37.8° C.: 2.02
Con. carbon, wt %: 0.25
Asphaltenes, wt %: <0.05
V/Ni, ppm: <0.5/<0.5
Yield C_4 & lighter, wt %: 0.51

Gasoline
Range, °C.: C_5—100
Yield, wt %: 8.17
Gravity, °API: 63.6
Sulfur, ppm: <1
Paraffins, vol %: 45.8
Naphthenes, vol %: 47.6
Aromatics, vol %: 6.6
RON, clear: 73.8
RON + 0.6 g TEL/l: 88.5

Naphtha
Range, °C.: 100-185
Yield, wt %: 25.12
Gravity, °API: 49.1
Sulfur, ppm: 68
P/N/A, vol %: 33.2/48.9/17.9

Kerosine
Range, °C.: 185-230
Yield, wt %: 15.98
Gravity, °API: 42.5
Sulfur, wt %: 0.038
Aromatics, vol %: 18
Smoke pt, mm: 22
Freezing pt., °C.: −50.5

Gas oil
Range, °C.: 185-375
Yield, wt %: 52.06
Gravity, °API: 37.5
Sulfur, wt %: 0.083
Vis., cSt @ 37.8° C.: 2.62
Aniline pt, °C.: 67.6
Pour pt, °C.: −21

Residue
Range, °C.: 375+
Yield, wt %: 14.14
Gravity, °API: 18.9
Sulfur, wt %: 0.22
Vis., cSt @ 50° C.: 835
Pour pt, °C.: >+45
Con. carbon, wt %: 1.7
V/Ni, ppm: <2/2

Bekok, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia as part of Tapis Blend

Crude
Gravity, °API: 49.07
Vis., cSt @ 100° F.: 1.74
Pour pt, °F.: 26
Sulfur, ppm: 210
Total nitrogen, wt %: 0.0136
Neutralization no., mg KOH/g: 0.035
Rvp, psi: 7.6
Con. carbon residue, wt %: 0.22
V/Ni, ppm: <l/<l
Wax, wt %: 6.05
Yield, C_4 & lighter: 2.7

Light naphtha
Range, °F.: C_5-145
Yield (VT), vol %: 7.05
RON, clear: 72

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 26.76
Sulfur, ppm: 5
Total nitrogen, ppm: 0.7
RON, clear: 45
Paraffins, wt %: 57.40
Naphthenes, wt %: 29.27
Aromatics, wt %: 13.33

Kerosine
Range, °F.: 330-450
Yield, vol %: 15.74
Sulfur, ppm: 20
Freezing pt, °F.: −45
Cloud pt, °F.: −47
Smoke pt, mm: 20
Cetane index: 57.33
Diesel index: 76.48
Vis., cSt @ 70° F.: 1.64

Distillate
Range, °F.: 450—650
Yield, vol %: 26.13
Gravity, °API: 41.65
Sulfur, ppm: 220
Cetane index: 64.34
Diesel index: 74.34
Aniline pt, °C.: 81.5
Vis., cSt @ 70° F.: 5.15

Heavy gas oil
Range, °F.: 680-975
Yield, vol %: 15.85
Gravity, °API: 32.84
Sulfur, ppm: 600
Total nitrogen, ppm: 533
Pour pt, °F.: 113
Con. carbon residue, wt %: 0.059
Sodium, ppm: 13.84
V/Ni, ppm: 0.008/<0.01
Vis., cSt @ 130° F.: 11.32

Atmospheric residue
Range, °F.: 650+
Yield, vol %: 21.62
Gravity, °API: 31.54
Sulfur, ppm: 700
Pour pt, °F.: 113
Con. carbon residue, wt %: 1.986
Sodium, ppm: 0.125
V/Ni, ppm: <0.002/<0.01
Vis., cSt @ 130° F.: 27.37

Note: Bekok is contributor to Tapis blend

Bintulu, Malaysia

Bintulu SBM terminal off Sarawak

Crude
Gravity, °API: 26.5
Vapor pressure, Kg/sq cm: 0.21
Pour pt, °C.: −5.0
Vis., cSt @ 56° C.: 4.54
Carbon residue, wt %: 1.69
Sulfur, wt %: 0.13
Acid no. KOH mg/g: 0.43
Nitrogen, ppm: 450
Distillation, °C.:
Ibp—28
5%—104
10%—135
15%—169
20%—199
25%—227
30%—245
35%—259
40%—273
45%—285
47%—290

Note: Bintulu comes solely from Temana field offshore Sarawak

Bunyu, Indonesia

Bunyu Island terminal off east coast of Kalimantan/Four point CBM

Crude
Gravity, °API: 31.7
Vis., cSt @ 100° F.: 2.67
Pour pt, °F.: 60
Rvp @ 100° F., psi: 1.0
Sulfur, wt %: 0.09
Wax, wt %: 8.3
Con. carbon residue, wt %: 0.39
Charac. factor, K UOP: 11.4

Gasoline
Range, °C.: C_5—175
Yield, vol %: 18.5
RON, clear: 74.9

Kerosine
Range, °C.: 175-300
Yield, vol %: 49.0
Smoke pt, mm: 10

Gas oil
Range, °C.: 300-350
Yield, vol %: 13.0
Diesel index: 41

Residue
Range, °C.: 350+
Yield, vol %: 19.5
Sulfur, wt %: 0.20
Pour pt, °F.: 115

Note: In late 1982 there were plans to mix Bunyu with Sembakung crude (37 °API). This assay of sample that did not contain Sembakung.

Champion Export, Brunei

Seria SBM

Crude
Gravity, °API: 23.9
Vis. @ 10° C., sq mm/sec: 21.1
Sulfur, wt %: 0.12
Wax, wt %: 0.4
Pour pt, °C.: < −36
Total acid no., mg KOH/g: 0.50
UOP K factor: 11.2
Yield light hydrocarbons, wt %: 0.70

Gasoline
Range, °C.: C_5—65
Yield, vol %: 0.4
Rvp, kPa: 70

Naphtha
Range, °C.: 65—100
Yield, vol %: 2.0
Sulfur, mg/kg: 24
RON, clear: 77
RON + 0.5 g Pb/l (TEL): 88

Naphtha
Range, °C.: 100-150
Yield, vol %: 4.5
SUlfur, mg/kg: 74
RON, clear: 71
Paraffins, wt %: 20
Naphthenes, wt %: 69
Aromatics, wt %: 11

Naphtha
Range, °C.: 150-200
Yield, vol %: 8.1
Density @ 15° C., kg/l: 0.827
Sulfur, mg/kg: 251
P/N/A, wt %: 15/69/16
Smoke pt, mm: 22

Kerosine
Range, °C.: 200-250
Yield, vol %: 16.2
Density @ 15° C.: 0.870
Sulfur, wt %; 0.06
Cloud pt, °C. < −60
Smoke pt, mm: 18
Aniline pt, °C.: 46.9
Cetane no.: 31

Gas oil
Range, °C.: 250-300
Yield, vol %: 22.6
Density @ 15° C., kg/l: 0.899
Vis. @ 40° C., sq mm/sec: 3.84
Pour pt, °C.: −57
Aromatics, wt %: 36
Smoke pt, mm: 15
Cetane no.: 29

Gas oil
Range, °C.: 300-350
Yield, vol %: 15.2
Density @ 15° C., kg/l: 0.930
Vis. @ 40° C., sq mm/sec: 10.2
Sulfur, wt %: 0.17

Heavy gas oil
Range, °C.: 350-370
Yield, vol %: 4.3
Density @ 15° C., kg/l: 0.951
Pour pt, °C.: −6
Total nitrogen, mg/kg: 194

Residue
Range, °C.: 370+
Yield, vol %: 26.4
Density @ 15° C.; kg/l: 0.991
Vis. @ 60° C., sq mm/sec: 912
Sulfur, wt %: 0.25
Pour pt, °C.: 21
V/Ni, mg/kg: <1/3

Note: Assay sample contained 67 vol % Champion crude, 18 vol % Magpie, and 15 vol % Seria Land Heavy.

Cinta, Indonesia

SBM and floating storage barge in Java Sea producing area

Crude
Gravity, °API: 33.4
Sulfur, wt %: 0.075
Pour pt, °F.: 105
Vis., cSt @ 100° F.: 64.34
Rvp, lb: 1.4
V/Ni, ppm: 0.1/9.5
Wax content, wt %: 30.3
C_5 & lighter, vol %: 3.143

Light naphtha
Range, °F.: C_5-180
Yield, vol %: 1.89
Sulfur, ppm: 2.3
RON, clear: 61.0
RON + 3 ml TEL/gal: 84.8

Naphtha
Range, °F.: 180-300
Yield, vol %: 4.84
Sulfur, ppm: 5.1
RON, clear: 48.4
RON + 3 ml TEL/gal: 74.4
Paraffins, vol %: 55.2
Olefins, vol %: 0.9
Naphthenes, vol %: 39.0
Aromatics, vol %: 4.9

Heavy naphtha
Range, °F.: 300-380
Yield, vol %: 4.02
Gravity, °API: 53.3
Sulfur, ppm: 12.0
P/O/N/A, vol %: 67.6/1.7/22.6/8.1

Kerosine
Range, °F.: 380-450
Yield, vol %: 2.04
Gravity, °API: 48.6
Sulfur, ppm: 91.4
Smoke pt, mm: 34
Pour pt, °F.: −30
Aniline pt, °F.: 156.7
Aromatics (FIA), %: 8.4
Cetane no.: 46.5
Diesel index: 76.2

Gas oil
Range, °F.: 450-650
Yield, vol %: 11.99
Gravity, °API: 42.2
Sulfur, wt %: 0.04
Cetane number: 58.5
Pour pt, °F.: 15
Vis., cSt @ 100° F.: 2.74

Heavy gas oil
Range, °F.: 650-1,050
Yield, vol %: 40.06
Gravity, °F.: 34.7
Sulfur, wt %: 0.065
Con. carbon, wt %: 0.07
Total nitrogen, wt %: 0.15
Basic nitrogen, wt %: 0.009
V/Ni, ppm: 0.1/0.1
Pour pt, °F.: 115
Aromatics (FIA), %: 15.6
Vis., cSt @ 130° F.: 10.0

Residue
Range, °F.: 650+
Yield, vol %: 74.3
Gravity, °API: 27.6
Sulfur, wt %: 0.09
Con. carbon, wt %: 6.05
V/Ni, ppm: 0.1/2.3
Pour pt, °F.: >120
Total nitrogen, wt %: 0.25
Vis., cSt @ 130° F.: 123.7

Daqing, China (see Taching)

Duri (Sumatran Heavy), Sumatra, Indonesia

Port of Dumai, Sumatra

Crude
Gravity, °API: 21.1
Sulfur, wt %: 0.20
Vis., cSt @ 122° F.: 131.9
Pour pt, °F.: 54
C_4 & lighter, vol %: 0.02

Light naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 0.48
Gravity, °API: 70.7
Sulfur, wt %: 0.007
Paraffins, vol %: 66.1
Naphtha, vol %: 33.5
Aromatics, vol %: 0.4

Heavy naphtha
Range (TBP), °F.: 200-340
Yield, vol %: 3.2
Gravity, °API: 51.1
Sulfur, wt %: 0.009
P/N/A, vol %: 31/62/7

Kerosine
Range (TBP), °F.: 340-460
Yield, vol %: 6.0
Gravity, °API: 36.3
Sulfur, wt %: 0.039
Smoke pt, mm: 18
Freeze pt, °F.: −73

Gas oil
Range (TBP), °F.: 460-650
Yield, vol %: 14.7
Gravity, °API: 27.4
Sulfur, vol %: 0.136
Pour pt, °F.: −1
Diesel index: 37.9

Reduced crude
Range (TBP), °F.: 650+
Yield, vol %: 75.6
Gravity, °API: 17.6
Sulfur, wt %: 0.21
Pour pt, °F.: 86
Vis., cSt @ 122° F.: 1,134
Rams. carbon, wt %: 7.8
V/Ni/Fe, wt % ppm: 1/16/0

Handil, Kalimantan, Indonesia

SBM about 6 miles offshore 27 miles northeast of Balikpapan

Crude
Gravity, °API: 32.75
Sulfur, wt %: 0.079
Pour pt, +85 °F.
Rvp, psi: 1.6
Vis., cSt @ 37.8° C.: 4.2
Con. carbon, wt%: 1
V/Ni, ppm: <0.5/<1
C_4 & lighter, wt %: 0.5

Gasoline
Range, °C.: C_5—75
Yield, wt %: 2.2
Gravity, °API: 69.4
Sulfur, ppm: 5
Paraffins, vol %: 64
Naphthenes, vol %: 20.2
Aromatics, vol %: 15.8
RON, clear: 79.7
RON + 0.6 g TEL/l: 89.2

Naphtha
Range, °C.: 75-145
Yield, wt %: 11.4
Gravity, °API: 45.8
Sulfur, ppm: 9
P/N/A, vol %: 21.8/33.3/44.9

Kerosine
Range, °C.: 145-250
Yield, wt %: 19.3
Gravity, °API: 33.6
Sulfur, ppm: 136
Aromatics (FIA), vol %: 44.2
Smoke pt, mm: 9
Freezing pt, °C.: −49

Gas oil
Range, °C.: 145-350
Yield, wt %: 46.3
Gravity, °API: 31.6
Sulfur, wt %: 0.061
Vis., cSt @ 20° C.: 2.49
Aniline pt, °C.: 51.8
Pour pt, °C.: −7

Residue
Range, °C.: 350+
Yield, wt %: 39.6
Gravity, °API: 25.1
Sulfur, wt %: 0.13
Vis., cSt @ 50° C.: 46.7
Pour pt, °C.: +45
Con. carbon, wt %: 2.6
V/Ni, ppm: <1/<2

Jatibarang, Java, Indonesia

SBM terminal about 6.5 nautical miles off north coast of Java

Crude
Gravity, °API: 29.0
Vis., cSt @ 122° F.: 83.8
Pour pt, °F.: 110
Rvp @ 100° F., psi: 0.2
Sulfur content, wt %: 0.07
Wax content, wt %: 24.6
Con. carbon residue, wt %: 7.53
Charac. factor, K UOP: 12.5

Gasoline
Range, °C.: Ibp-100
Yield, vol %: 3.6
RON, clear: 70.0

Naphtha
Range, °C.: 100-175
Yield, vol %: 7.9
Paraffins, vol %: 46.0
Naphthenes, vol %: 43.0
Aromatics, vol %: 11.0

Kerosine
Range, °C.: 175-250
Yield, vol %: 7.0
Smoke pt, mm: 21.0

Gas oil
Range, °C.: 250-350
Yield, vol %: 13.1
Diesel index: 67.5

Residue
Range, °C.: 350+
Yield, vol %: 68.4
Sulfur, wt %: 11.0
Pour pt, °F.: 120

Labuan Blend, Sabah, Malaysia

SBM in South China Sea off Labuan Island terminal

Crude
Gravity, °API: 33.2
Vis., cSt @ 70° F.: 4.41
Pour pt, °F.: 52
Sulfur, ppm: 917
Neut. no., mg KOH/g: 0.30
Rvp, psi: 3.52
Con. carbon residue, wt %: 2.54
V/Ni, ppm: 0.015/<0.002
Wax content, wt %: 2.34
Asphaltene content, wt %: 0.22
C_5 & lighter, wt %: 1.3

Light naphtha
Range, °F.: C_5-145
Yield, vol %: 2.0
Sulfur, ppm: <5
Rvp, psi: 12.4

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 18.80
Sulfur, ppm: 20
RON, clear: 67.0
RON + 3 cc TEL/U.S. gal: 85.0
Paraffins, wt %: 17.52
Naphthenes, wt %: 74.58
Aromatics, wt %: 7.89

Kerosine
Range, °F.: 330-450
Yield, vol %: 18.00
Gravity, °API: 38.70
Sulfur, ppm: 140
Freezing pt, °F.: −81.4
Pour pt, °F.: <−17
Smoke pt, mm: 21
Cetane index: 34.39
Diesel index: 44

Distillate
Range, °F.: 450-650
Yield, vol %: 38.27
Gravity, °API: 29.27
Sulfur, wt %: 0.07
Cloud pt, °F.: 19.4
Cetane index: 40.09
Diesel index: 38
Aniline pt, °C.: 55
Con. carbon residue, wt %: nil
Vis., cSt @ 70° F.: 6.43

Residue
Range, °F.: 650+
Yield, vol %: 21.96
Sulfur, wt %: 0.15
Nitrogen, ppm: 531
Pour pt, °F.: 89.6
Con. carbon residue, wt %: 1.62
V/Ni, ppm: 0.03/0.08
Vis., cSt @ 100° F.: 125.8

Heavy gas oil
Range, °F.: 680-975
Yield, vol %: 16.83
Gravity, °API: 15.79
Sulfur, wt %: 0.14
Total nitrogen, ppm: 586
Basic nitrogen, ppm: 144
Pour pt, °F.: 98
Con. carbon residue, wt %: 0.30
Vis., cSt @ 100° F.: 173.61

Note: Labuan Blend comes from offshore fields connected to North Sabah Trunk Line. They include Samarang and South Furious. Erb West, St. Joseph and Barton were to be added during late 1983.

Minas (Sumatran Light), Sumatra, Indonesia

Port of Dumai, Sumatra

Crude
Gravity, °API: 34.5
Sulfur, wt %: 0.081
Vis., cSt @ 122° F.: 12.4
Pour pt, °F.: 97
C_4 & lighter, vol %: 0.27

Light naphtha
Range (TBP), °F.: C_5-200
Yield, vol %: 2.83
Gravity, °API: 80.0
Sulfur, wt %: 0.001
Paraffins, vol %: 75
Naphtha, vol %: 25
Aromatics, vol %: nil

Heavy naphtha
Range (TBP), °F.: 200-340
Yield, vol %: 9.4
Gravity, °API: 60.2
Sulfur, wt %: 0.002
P/N/A, vol %: 62/30/8

Kerosine
Range (TBP), °F.: 340-460
Yield, vol %: 10.5
Gravity, °API: 47.2
Sulfur, wt %: 0.015
Smoke pt, mm: 35
Freeze pt, °F.: −34

Gas oil
Range (TBP), °F.: 460-650
Yield, vol %: 20.2
Gravity, °API: 39.6
Sulfur, vol %: 0.061
Pour pt, °F.: 44
Diesel index: 72

Reduced crude
Range (TBP), °F.: 650+
Yield, vol %: 56.8
Gravity, °API: 26.5
Sulfur, wt %: 0.15
Pour pt, °F.: 106
Vis., cSt @ 122° F.: 101.2
Rams. carbon, wt %: 5.1
V/Ni/Fe, wt % ppm: 1/15/10

Miri Light, Sarawak, Malaysia

SBMs off Miri terminal

Crude
Gravity, °API: 36.27
Vis., cSt @ 70° F.: 3.65
Pour pt, °F.: 34
Sulfur, ppm: 825
Total nitrogen, wt %: 0.0137
Neut. no., mg KOH/g: 0.175
Rvp, psi: 4.7
Con. carbon residue, wt %: 2.94
V/Ni, ppm: 0.012/<0.002
Wax content, wt %: 2.83
Asphaltene content, wt %: 0.258
C_5 & lighter, wt %: 2.2

Light naphtha
Range, °F.: C_5-145
Yield, vol %: 1.60
Sulfur, ppm: <5
Rvp, psi: 10.5

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 23.10
Sulfur, ppm: 17
RON, clear: 66.5
RON + 3 cc TEL/U.S. gal: 84.5
Paraffins, wt %: 14.55
Naphthenes, wt %: 68.94
Aromatics, wt %: 16.51

Kerosine
Range, °F.: 330-450
Yield, vol %: 15.80
Sulfur, ppm: 125
Freezing pt, °F.: < −70
Gravity, °API: 40.65
Smoke pt, mm: 21
Cetane index: 35.3
Diesel index: 47

Light distillate
Range, °F.: 450-650
Yield, vol %: 33.09
Gravity, °API: 30.99
Sulfur, ppm: 600
Cetane index: 41.1
Diesel index: 43
Aniline pt, °C.: 60
Vis., cSt @ 70° F.: 6.23

Residue
Range, °F.: 650+
Yield, vol %: 25.26
Gravity, °API: 21.01
Sulfur, wt %: 0.17
Pour pt, °F.: 100.4
Con. carbon residue, wt %: 2.22
V/Ni, ppm: 0.030/<0.001
Vis., cSt @ 100° F.: 217.26

Heavy gas oil
Range, °F.: 680-975
Yield, vol %: 20.26
Gravity, °API: 20.71
Sulfur, ppm: 0.15
Total nitrogen, ppm: 584
Basic nitrogen, ppm: 95
Pour pt, °F.: 35
Vis., cSt @ 100° F.: 103.85

Note: Miri is blend of 7 offshore fields. Miri Land crude no longer produced.

Pulai, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia, as part of Tapis Blend.

Crude
Gravity, °API: 42.52
Vis., cSt @ 70° F.: 2.12
Pour pt, °F.: 23
Sulfur ppm: 160
Total nitrogen, ppm: 33.5
Rvp, psi: 2.7
Con. carbon residue, wt %: 0.11
V/Ni, ppm: 1.4/0.1
Wax content, wt %: 3.11
Asphaltene content, wt %: 0.31
C_4 & lighter, vol %: 0.45

Light naphtha
Range, °F.: C_5-145
Yield, vol %: 2.03
Sulfur, ppm: <5

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 27.93
Sulfur, ppm: <5
RON, clear: <70
Paraffins, wt %: 31.83
Naphthenes, wt %: 26.44
Aromatics, wt %: 31.38

Kerosine
Range, °F.: 330-450
Yield, vol %: 27.85
Sulfur, ppm: 19
Freezing pt, °F.: −67
Pour pt, °F.: −66
Smoke pt, mm: 21
Cetane index: 43.17
Diesel index: 56.62
Vis., cSt @ 70° F.: 1.71

Light distillate
Range, °F.: 450-650
Yield, vol %: 34.14
Gravity, °API: 34.8
Sulfur, ppm: 270
Cloud pt, °F.: +14
Cetane index: 48.63
Diesel index: 54.04
Aniline pt, °C.: 68.5
Vis., cSt @ 70° F.: 5.01

Residue
Range, °F.: 650+
Yield, vol %: 7.60
Gravity, °API: 28.20
Sulfur, ppm: 800
Nitrogen, ppm: 323
Pour pt, °F.: 102
Aniline pt, °C.: 91
Con. carbon residue, wt %: 1.58
V/Ni, ppm: <0.01/<0.01
Vis., cSt @ 130° F.: 17.53
Note: Pulai is contributor to Tapis Blend

Salawati, West Irian, Indonesia

Salawati marine terminal (breasting and mooring dolphins and storage barge) on Sele Strait

Crude
Gravity, °API: 38.0
Vis., cSt @ 100° F.: 4.2
Pour pt, °F.: −15
Rvp @ 100° F., psi: 0.6
Sulfur, wt %: 0.49
Wax content, wt %: 8.42
Con. carbon residue, wt %: 1.3
Charac. factor K UOP: 12.0

Gasoline
Range, °C.: C_5-94
Yield, vol %: 1.0

Naphtha
Range, °C.: 94-149
Yield, vol %: 10.7
Paraffins, vol %: 71.4
Naphthenes, vol %: 27.9
Aromatics, vol %: 0.8

Kerosine
Range, °C.: 149-260
Yield, vol %: 35.4
Smoke pt, mm: 35.5
Freezing pt, °F.: −28

Gas oil
Range, °C.: 260-344
Yield, vol %: 21.5
Cetane index: 58.6

Residue
Range, °C.: 344+
Yield, vol %: 31.4
Sulfur, wt %: 1.1
Pour pt, °F.: 115

Sanga Sanga, Kalimantan, Indonesia

Crude
Gravity, °API: 25.7
Rvp, psi @ 100° F.: 0.8
Sulfur, wt %: 0.17
Pour pt, °F.: +5
V/Ni, ppm: nil/0.9
Vis., SUS @ 100° F.: 151.3
Con. carbon residue, wt %: 0.79

Naphtha
Range, °F.: Ibp-350
Yield, vol %: 13.2
Rvp, psi @ 100° F.: 2.7
Sulfur, wt %: 0.015

Kerosine
Range, °F.: 350-450
Yield, vol %: 12.4
Aniline pt, °C.: 118
Sulfur, wt %: 0.04
Smoke pt, mm: 16

Diesel
Range, °F.: 450-650
Yield, vol %: 41.6
Gravity, °API: 25.3
Aniline pt, °C.: 133
Cetane index (calc.): 36.5
Sulfur, wt %: 0.13
Pour pt, °F.: +25
Vis., SUS @ 100° F.: 41.6

Fuel oil
Range, °F.: 650+
Yield, vol %: 32.8
Gravity, °API: 19.3
Sulfur, wt %: 0.31
Pour pt, °F.: +105
V/Ni, ppm: Nil/1.4

Sepinggan-Yakin Mixed (4:1), East Kalimantan, Indonesia

Lawi-Lawi terminal about 12 miles south of Balikpapan/ SBM about 6 miles offshore in Makasar Straits

Crude
Gravity, °API: 31.7
Vis., cSt @ 100° F.: 3.16
Pour pt, °F.: 20
Rvp, psi @ 100° F.: 2.6
Total acid no., mg KOH/g: 0.3
Sulfur content, wt %: 0.11
Con. carbon residue, wt %: 0.54

Gasoline
Range, °C.: C_5-100
Yield, vol %: 1.5

Naphtha
Range, °C.: 100-175
Yield, vol %: 19.5

Kerosine
Range, °C.: 175-250
Yield, vol %: 21.5

Gas oil
Range, °C.: 250-350
Yield, vol %: 35.5

Fuel oil
Range, °C.: 350+
Yield, vol %: 22.0

Seria Light, Brunei

Lutong terminal

Crude
Gravity, °API: 36.2
Rvp, psi: 6.0
Sulfur, wt %: 0.07
Pour pt, °F.: 35
Vis., SSU @ 80° F.: 36.5
Yield, Ibp-113° F., vol %: 5.77

Gasoline
Range, °F.: 113-220
Yield, vol %: 10.23
RON + 3 cc TEL/gal: 85.0

Naphtha
Range, °F.: 220-390
Yield, vol %: 21.41
Paraffins, vol %: 35.9
Naphthenes, vol %: 34.6
Dinaphthenes, vol %: 11.8
Aromatics, vol %: 17.7

Light distillate
Range, °F.: 390-550
Yield, vol %: 26.63
Gravity, °API: 33.0
Cetane index: 35.0
Sulfur, wt %: 0.04
Aniline pt, °F.: 129.5
Pour pt, °F.: −35
Range, °F.: 550-650
Yield, vol %: 13.88
Gravity, °API: 29.0

Light gas oil
Range, °F.: 450-650
Yield, vol %: 31.74
Gravity, °API: 30.1
Cetane index: 40.7
Sulfur, wt %: 0.07

Heavy gas oil
Range, °F.: 650-971
Yield, vol %: 18.89
Gravity, °API: 18.0
Sulfur, wt %: 0.15
Total nitrogen, ppm: 513
Basic nitrogen, ppm: 262
Pour pt, °F.: 95
Carbon residue, wt %: 0.18

Vacuum flashed residue
Range, °F.: 971+
Yield, vol %: 3.19
Gravity, °API: 10.0
Sulfur, wt %: 0.32

Shengli, China

Qingdao terminal on Yellow Sea

Crude
Gravity, °API: 24.2
Rvp, psi: 0
Sulfur, wt %: 1.00
Pour pt, °F.: +70
Vis., SFS @ 122° F.: 48.3
Acid no.: 1.16

Light ends
Range, °F.: Ibp-160
Yield, vol %: 2.0

Light naphtha
Range, °F.: 160-290
Yield, vol %: 3.3
Paraffins, vol %: 45.9
Naphthenes, vol %: 44.7
Aromatics, vol %: 9.4

Heavy naphtha
Range, °F.: 290-390
Yield, vol %: 3.7
Gravity, °API: 47.5
Sulfur, wt %: 0.05
P/N/A, vol %: 48.9/30.9/20.2

Kerosine
Range, °F.: 390-500
Yield, vol %: 6.2
Gravity, °API: 39.9
Sulfur, wt %: 0.23
Olefins, vol %: 0.9
Aromatics, vol %: 16.5
Smoke pt, mm: 17
Freeze pt, °F.: −29.2

Diesel
Range, °F.: 500-660
Yield, vol %: 12.3
Gravity, °API: 34.7
Sulfur, wt %: 0.53
Pour pt, °F.: +40
Cetane index: 52.6
Cloud pt, °F.: +42

Light gas oil
Range, °F.: 660-780
Yield, vol %: 9.7
Gravity, °API: 31.4
Sulfur, wt %: 0.65
Vis., SSU @ 100° F.: 76.0
Pour pt, °F.: +80
Aniline pt, °F.: 183.0
UOP K factor: 12.1
Carbon residue, wt %: 0.06

Heavy gas oil
Range, °F.: 780-1,050
Yield, vol %: 26.4
Gravity, °API: 24.8
Sulfur, wt %: 0.79
Vis., SSU @ 210° F.: 78.3
Pour pt, °F.: +110
Aniline pt, °F.: 202.0
Carbon residue, wt %: 0.28

Bottoms
Range, °F.: 1,050+
Yield, vol %: 36.4
Gravity, °API: 11.7
Sulfur, wt %: 1.66
Vis., SSF @ 210° F.: 1,097.8
Carbon residue, wt %: 16.4

Soviet Export Blend, U.S.S.R.

Terminals: Ventspils, Baltic and Novorossysk, Black Sea

Crude
Gravity, °API: 32.5
Sulfur, wt %: 1.38
Rvp, kPa: 49.2
Pour pt, °C: −23
Vis. @ 20° C.: 11.5

Light naphtha
Range (TBP), °C.: Ibp-90
Yield, wt %: 10.3
Density @ 15° C., g/ml: 0.676
Sulfur, wt %: 0.005
Paraffins, wt %: 71.7
Naphthenes, wt %: 26.5
Aromatics, wt %: 1.8

Heavy naphtha
Range (TBP), °C.: 90-180
Yield, wt %: 11.3
Density @ 15 °C., g/ml: 0.761
Sulfur, wt %: 0.029
P/N/A, vol %: 38.5/52.0/9.5

Kerosine
Range (TBP), °C.: 180-220
Yield, wt %: 6.5
Density @ 15 °C., g/ml: 0.806
Sulfur, wt %: 0.15
Aromatics, vol %: 20.1
Freeze pt, °C.: −57
Smoke pt, mm: 25
Aniline pt, °C.: 62.5
Vis., cSt @ 20° C.: 1.73

Light gas oil
Range (TBP), °C.: 180-350
Yield, wt %: 24.3
Density @ 15° C., g/ml: 0.840
Cetane index (calc.): 49.5
Sulfur, wt %: 0.57
Pour pt, °C.: −29
Aniline pt, °C.: 67.5
Vis., cSt @ 20° C.: 3.69

Heavy gas oil
Range (TBP), °C.: 350-515
Yield, wt %: 29.4
Density @ 15° C., g/ml: 0.915
Sulfur, wt %: 1.9
Vis., cSt @ 50° C.: 26.0
V/Ni, ppm: 0.15/0.17

Long residuum
Range, °C.: 350
Yield, wt %: 54.1
Density @ 15° C., g/ml: 0.952
Sulfur, wt %: 2.59
Rams. carbon, wt %: 8.2
Vis., cSt @ 50° C.: 191

Short residuum
Range, °C.: 515
Yield, wt %: 26.4
Sulfur, wt %: 2.98
Rams. carbon, wt %: 16.4
Vis. @ 60° C.: 3.9
V/Ni, ppm: 154/53

Note: Crude on which this assay was based was shipped from Ventspils. It is claimed that crude from either port is of similar quality.

Taching (Daqing), China

Luda (Darien) terminal on Yellow Sea

Crude
Gravity, °API: 33.0
Sulfur, wt%: .078
Pour pt, °F.: ±95

Light ends
Range, °F.: Ibp-160
Yield, vol %: 1.8

Light naphtha
Range, °F.: 160-290
Yield, vol %: 5.4
Sulfur, wt %: 0.0130
Paraffins, vol %: 46.6
Olefins, vol %: 0.4
Naphthenes, vol %: 50.4
Aromatics, vol %: 2.6

Heavy naphtha
Range, °F.: 290-390
Yield, vol %: 5.8

Sulfur, wt %: 0.010
P/O/N/A, vol %: 39.6/1.5/52.4/6.5

Kerosine
Range, °F.: 390-500
Yield, vol %: 7.7
Gravity, °API: 44.0
Sulfur, wt %: 0.0127
Olefins, vol %: 3.2
Aromatics, vol %: 11.1
Smoke pt, mm: 22
Freezing pt, °F.: −13.9

Diesel
Range, °F.: 500-635
Yield, vol %: 7.2
Gravity, °API: 39.2
Sulfur, wt %: 0.0390
Vis., SSU @ 100° F.: 40.2
Pour pt, °F.: +40
Aniline pt, °F.: 178.0
Diesel index: 69.8

Light gas oil
Range, °F.: 635-775
Yield, vol %: 16.3
Gravity, °API: 37.0
Sulfur, wt %: 0.0480
Vis., SSU @ 100° F.: 52.1
Pour pt, °F.: +80
Carbon residue, wt %: 0.01

Heavy gas oil
Range, °F.: 775-932
Yield, vol %: 18.9
Gravity, °API: 31.4
Sulfur, wt %: 0.1140
Vis., SSU @ 210° F.: 48.1
Pour pt, °F.: +115
UOP K factor: 12.5
Carbon residue, wt%: 0.03

Bottoms
Range, °F.: 932+
Yield, vol %: 36.9
Gravity, °API: 21.2
Sulfur, wt %: 0.14
Vis., SSF @ 210° F.: 52.2
Carbon residue, wt %: 7.3
V/Ni, ppm: 1.0/0

Tapis, Malaysia

Piped ashore to terminal north of Chukai, Kuala Trengganu area, peninsular Malaysia, as part of Tapis Blend

Crude
Gravity, °API: 44.30
Vis., cSt @ 70° F.: 2.69
Pour pt, °F.: 39
Sulfur, ppm: 230
Total nitrogen, ppm: 134
Basic nitrogen, ppm: 10.1
Neut. no., mg KOH/g: 0.04
Rvp, psi: 2.5
Con. carbon residue, wt %: 2.17
V/Ni, ppm: <0.002/0.17
Wax content, wt %: 5.75
Asphaltene content, wt %: 0.112
Yield, C_4 & lighter, vol %: 0.97

Light gasoline
Range, °F.: C_5-145
Yield, vol %: 2.97
Sulfur, ppm: <5
Rvp, psi: 10.4
RON, clear: 74
RON + 3 cc TEL/U.S. gal: 92.5
Paraffins, wt %: 84.15
Naphthenes, wt %: 13.22
Aromatics, wt %: 2.63

Heavy naphtha
Range, °F.: 145-330
Yield, vol %: 23.47
Sulfur, ppm: 13
RON, clear: 53
P/N/A, wt %: 40.26/31.08/28.66

Kerosine
Range, °F.: 330-450
Yield, vol %: 20.70
Sulfur, ppm: 23
Freezing pt, °F.: −40
Smoke pt, mm: 20
Cetane index: 55.87
Diesel index: 74

Light distillate
Range, °F.: 450-650
Yield, vol %: 34.27
Gravity, °API: [illegible]
Sulfur, ppm: 1[illegible]
Cetane index: 61.9
Aniline pt, °C.: 79.5
Vis., SUS @ 70° F.: 41.35

Residue
Range, °F.: 650+
Yield, vol %: 17.62
Gravity, °API: 29.58
Sulfur, ppm: 700
Pour pt, °F.: 108
Con. carbon residue, wt %: 2.024
V/Ni, ppm: 0.31/0.01
Vis., SUS @ 130° F.: 102.31

Note: Tapis is contributor to Tapis Blend

Tapis Blend, Malaysia

Piped ashore to terminal north of Chukar, Kuala Trengganu area, peninsular Malaysia

Tapis Blend comprises oil from six fields in the South China Sea. They are Tapis, Pulai, Bekok, Tiong, Tingge, and Kepong. The latter three fields only recently began contributing to blend and assays had not yet been run at mid 1983. Tapis crude originally made up 60% of blend, Pulai and Bekok 40%. Assays are presented for these three crudes.

Tembungo, Sabah, Malaysia

Production platform in offshore producing area

Crude
Gravity, °API: 37.4
Sulfur, wt %: 0.04
Pour pt, °F.: +25
Vis., cSt @ 100° F.: 2.0
Rvp, psi: 2.8
Salt content, lb/1,000 bbl: 2.3

Light naphtha
Range, °F.: C_5-160
Yield, vol %: 2.4
Gravity, °API: 81.0
Sulfur, wt %: 0.001
Rvp, psi: 12.6
Paraffins, vol %: 83.0
Naphthenes, vol %: 17.0
Aromatics, vol %: Nil

Heavy naphtha
Range, °F.: 160-300
Yield, vol %: 17.9
Gravity, °API: 53.0
Sulfur, wt %: 0.004
Paraffins, vol %: 27.0
Naphthenes, vol %: 59.0
Aromatics, vol %: 14.0

Light distillate
Range, °F.: 300-510
Yield, vol %: 35.7
Gravity, °API: 36.0
Sulfur, wt %: 0.04
Freeze point, °F.: −45 est.
Smoke pt, mm: 13.0
Paraffins, vol %: 30.0
Naphthenes, vol %: 36.0
Aromatics, vol %: 34.0

Heavy distillates
Range, °F.: 510-650
Yield, vol %: 28.9
Gravity, °API: 33.0
Sulfur, wt %: 0.06
Pour pt, °F.: +15.0
Aniline pt, °F.: 153.0
Diesel index: 50.5

Resid
Range, °F.: 650+
Yield, vol %: 13.5
Gravity, °API: 25.0
Sulfur, wt %: 0.14
Pour pt, °F.: 85.0
Vis., cSt @ 100° F.: 42.0
Con. carbon, wt %: 0.55

Udang, Natuna Sea, Indonesia

Storage vessel with SBM about 43 nautical miles north of Anambas Island

Crude
Gravity, °API: 38.0
Kin. vis. @ 130° F.: 8.71
Con. carbon residue, wt %: 3.0
Sulfur, wt %: 0.05
V/Ni, ppm: 0.9/3.5
Pour pt, °C.: +37.8
Rvp, psi: nil
C_4 & lighter, vol %: 0.36

Naphtha
Range (TBP), °F.: 90-375
Yield, vol %: 15.2
Gravity, °API: 63.3
Paraffins, vol %: 75.5
Naphthenes, vol %: 20.3
Sulfur, wt %: <0.005

Kerosine
Range, °F.: 375-520
Yield, vol %: 11.4
Gravity, °API: 47.7
Sulfur, wt %: 0.005
Aromatics, vol %: 6

Heavy distillate
Range, °F.: 520-700
Yield, vol %: 18.7
Gravity, °API: 41.6
Sulfur, wt %: 0.02

Gas oil
Range, °F.: 700-1,010
Yield, vol %: 34.6
Gravity, °API: 35.4
Sulfur, wt %: 0.04

Residue
Range, °F.: 1,010+
Yield, vol %: 19.7
Gravity, °API: 20.9
Sulfur, wt %: 0.10
Kin. vis. @ 210° F.: 150
Con. carbon residue, wt %: 12.2
V/Ni, ppm: 4/16

Wallio, West Irian, Indonesia

Kasim marine terminal (CBM) between island of Jef Kasim and mainland Irian Jaya

Crude
Gravity, °API: 34.05
Vis., cSt @ 100° F.: 5.0
Rvp @ 100° C., psi: 3.7
Acid no., mg KOH/g: 0.30
Con. carbon residue, wt %: 2.18
Charac. factor K UOP: 11.7

Gasoline
Range, °C.: C_5-95
Yield, vol %: 4.5

Naphtha
Range, °C.: 95-185
Yield, vol %: 19.0
Paraffins, vol %: 63.3
Naphthenes, vol %: 30.7
Aromatics, vol %: 6.0

Kerosine
Range, °C.: 185-260
Yield, vol %: 16.7
Smoke pt, mm: 22.0
Freezing pt, °C.: −46

Gas oil
Range, °C.: 260-350
Yield, vol %: 20.0
Diesel index: 56.1

Fuel oil
Range, °C.: 350+
Yield, vol %: 39.8
Sulfur, wt %: 1.36
Pour pt, °F.: 100

Latin America

BCF 24, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 23.5
Sulfur, wt %: 1.85
Vis., SUS @ 100° F.: 192.2
Pour pt, °F.: −60
Yield, 0°(IVT) - −82° F., vol %: 1.53

Light naphtha
Range, °F.: 82-200
Yield, vol %: 3.80
Sulfur, wt %: 0.0011
Paraffins, %: 71.37
Naphthenes, %: 26.70
Aromatics, %: 1.93

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 5.0
Sp gr: 0.7565
Sulfur, wt %: 0.0066
P/N/A, %: 48.24/39.87/11.89
RON clear: 65.4

Naphtha
Range, °F.: 300-350
Yield, vol %: 2.82
P/N/A, %: 41.95/42.21/15.84

Kerosine
Range, °F.: 350-400
Yield, vol %: 3.14
P/N/A, %: 37.59/44.45/17.95
Sulfur, wt %: 0.1186
Freeze pt, °F.: −91.39
Smoke pt, mm: 22.25
Cetane no.: 46.06
Aniline pt, °F.: 128.05

Gas oil
Range, °F.: 400-500
Yield, vol %: 7.53
Gravity, °API: 37.37
Sulfur, wt %: 0.3027
Kin. vis. @ 122° F.: 1.51
Freeze pt, °F.: −63.27
Smoke pt, mm: 19.33
Aniline pt, °F: 136.44
Cetane no.: 42.20

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.55

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.73
Sulfur, wt %: 1.06
Gravity, °API: 29.07
Kin. vis. @ 122° F.: 4.62
Pour pt, °F.: 4.13
Smoke pt, mm: 7.22
Aniline pt, °F.: 150.73

Residue
Range, °F.: 650+
Yield, vol %: 61.91
Gravity, °API: 13.26
Sulfur, wt %: 2.58
Kin. vis. @ 122° F.: 2,295
Ni/V, ppm: 40/347

Bachaquero, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 16.8
Sulfur, wt %: 2.4
Vis., SUS @ 100° F.: 1,362
Pour pt, °F.: −10
Rvp, psi: 1.6
Yield, 0° (IVT) - −82° F., vol %: 0.80

Light naphtha
Range, °F.: 82-200
Yield, vol %: 2.44
Sulfur, wt %: 0.0075
Paraffins, %: 66.17
Naphthenes, %: 31.28
Aromatics, %: 2.55
RON clear: 71.7

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 3.54
Sulfur, wt %: 0.026
P/N/A, wt %: 29.38/58.96/11.66
RON clear: 66.7

Naphtha
Range, °F. 300-350
Yield, vol %: 1.81
Sp gr: 0.8018
Sulfur, wt %: 0.1107
P/N/A, %: 23.20/59.59/17.21

Kerosine
Range, °F.:350-400
Yield, vol %: 2.11
Sp gr: 0.8227
Sulfur, wt %: 0.19
P/N/A, %: 25.12/54.49/20.39
Freeze pt, °F.: −74.12
Smoke pt, mm: 17.75
Cetane no.: 48.56

Gas oil
Range, °F.: 400-500
Yield, vol %: 6.37
Gravity, °API: 35.43
Sulfur, wt %: 0.52
Aromatics, wt %: 25.29
Freeze pt, °F.: −66.62
Smoke pt, mm: 9.23
Cetane no.: 46.36
Aniline pt., °F.: 127.39
Cetane index: 39.98

Gas oil
Range, °F.: 500-550
Yield, vol %: 3.93

Gas oil
Range, °F.: 550-650
Yield, vol %: 8.95
Sulfur, wt %: 1.36
Pour pt, °F.: −47.99
Smoke pt, mm: 2.83
Aniline pt, °F.: 138.64

Residue
Range, °F.: 650+
Yield, vol %: 70.24
Gravity, °API: 9.39
Sulfur, wt %: 3.0
Kin. vis. @ 122° F.: 8,672
Ni/V, ppm: 74/435

Boscan, Venezuela

Bajo Grande, Lake Maracaibo

Crude
Gravity, °API: 10.10
Sulfur, wt %: 5.5
Vis. SUS @ 100° F.: 90,000
Pour pt, °F.: +50

Light naphtha
Range, °F.: 82-200
Yield, vol %: 0.55

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 1.32
Sulfur, wt %: 0.68
Paraffins, %: 53.28

Naphtha
Range, °F.: 300-350
Yield, vol %: 0.88
Sulfur, wt %: 1.28
Paraffins, %: 34.9

Kerosine
Range, °F.: 350-400
Yield, vol %: 1.28
Sulfur, wt %: 1.88
Aromatics, %: 24.04
Pour pt, °F.: −141.0
Smoke pt, mm: 16.0
Aniline pt, °F.: 112.69

Gas oil
Range, °F.: 400-500
Yield, vol %: 3.96
Gravity, °API: 34.0
Sulfur, wt %: 3.14
Kin. vis. @ 122° F.: 1.81
Pour pt, °F.: −77.53
Smoke pt, °F.: 16.11

Aniline pt, °F.: 113.83
Cetane index: 37.24

Gas oil
Range, °F.: 500-550
Yield, vol %: 2.66
Gravity, °API: 28.62
Sulfur, wt %: 4.02

Gas oil
Range, °F.: 550-650
Yield, vol %: 6.46
Gravity, °API: 25.54
Sulfur, wt %: 4.47
Pour pt, °F.: −10.9
Cetane no.: 38.0
Aniline pt, °F.: 117.3
Cetane index: 42.27

Residue
Range, °F.: 650+
Yield, vol %: 82.9
Sulfur, wt %: 5.86
Gravity, °API: 6.10
Sulfur, wt %: 5.86
Ni/V, ppm: 175/1,407
Kin. vis. @ 122° F.: 22,502

Ceuta, Venezuela

Puerto Miranda, Lake Maracaibo

Crude
Gravity, °API: 31.8
Sulfur, wt %: 1.2
Vis., SUS @ 100° F.: 62
Pour pt, °F.: −35
Rvp: 2.7
Yield, 0°(IVT) - −82° F., vol %: 2.10

Light naphtha
Range, °F.: 82-200
Yield, vol %: 7.51
Sulfur, wt %: 0.002
Paraffins, %: 75.69
Naphthenes, %: 19.85
Aromatics, %: 4.46
RON clear: 71.5

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 9.89
Sulfur, wt %: 0.01
P/N/A, %: 50.88/32.07/17.05
RON clear: 60.9

Naphtha
Range, °F.: 300-350
Yield, vol %: 5.36
P/N/A, %: 42.25/38.78/18.98

Kerosine
Range, °F.: 350-400
Yield, vol %: 5.28
Gravity, °API: 44.1
Sulfur, wt %: 0.054
P/N/A, %: 39.8/41.1/19.0
Smoke pt, mm: 21.39
Aniline pt, °F.: 122.8
Cetane index: 40.9

Gas oil
Range, °F.: 400-500
Yield, vol %: 9.93
Gravity, °API: 38.75
Sulfur, wt %: 0.33
Aromatics, %: 19.10
Smoke pt, mm: 19.59
Aniline pt, °F.: 136.18
Cetane index: 41.84

Gas oil
Range, °F.: 500-550
Yield, vol %: 5.0
Gravity, °API: 34.64
Sulfur, wt %: 0.72

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.24
Gravity, °API: 30.17
Sulfur, wt %: 1.0
Aniline pt, °F.: 155.8
Cetane index: 48.03

Residue
Range, °F.: 650+
Yield, vol %: 45.69
Gravity, °API: 16.60
Sulfur, wt %: 2.05
Ni/V, ppm: 54/281

Galeota Mix (Trinidad Blend), Trinidad Tobago

Point Galeota SBM

Crude
Gravity, °API: 32.8
Sulfur, wt %: 0.27
Rvp, psi: 2.0
Pour pt, °F.: −5
Neut. no., mg KOH/g: 0.84
Rams. carbon, wt %: 0.5
Kin. vis., cSt @ 100° F.: 4.32
V/Ni, ppm: 0/1
Yield C_4 & lighter, vol %: 0.6

Naphtha
Range, °F.: C_5-200
Yield, vol %: 3.7
Sulfur, wt %: 0.010
Paraffins, vol %: 63.1
Naphthenes, vol %: 30.5
Aromatics, vol %: 6.4
RON clear: 73.1

Heavy naphtha
Range, °F.: 200-320
Yield, vol %: 8.7
Sulfur, wt %: 0.017
P/N/A, vol %: 39.4/44.9/15.7
RON clear: 63.8

Kerosine
Range, °F.: 320-520
Yield, vol %: 28.8
Gravity, °API: 36.6
Sulfur, wt %: 0.054
Aniline pt, °F.: 126.7
Diesel index: 46.3
Cetane index: 35.6
Freeze pt, °F.: −56
Smoke pt, mm: 20

Gas oil
Range, °F.: 520-650
Yield, vol %: 25.6
Gravity, °API: 30.3
Sulfur, wt %: 0.223
Aniline pt, °F.: 151.0
Diesel index: 45.8
Cetane index: 44.6
Pour pt, °F.: 11

Gas oil
Range, °F.: 650-850
Yield, vol %: 20.1
Gravity, °API: 26.6
Sulfur, wt %: 0.454
Nitrogen, wt %: 0.030
Vis., SUS @ 122° F.: 77.8

Residue
Range, °F.: 650+
Yield, vol %: 32.8
Gravity, °API: 24.2
Sulfur, wt %: 0.607
Pour pt, °F.: +65
Nitrogen, wt %: 0.086
Rams. carbon, wt %: 1.35
Vis., SUS @ 122° F.: 200.3
V/Ni, ppm: 1/1

Isthmus, Mexico

Pajaritos, Veracruz, and Salina Cruz (Pacific), Oaxaca

Crude
Gravity, °API @ 60° F.: 32.8
Sulfur, wt %: 1.51
Pour test, °F.: −15
Vis., SUS @ 70° F.: 65.53
Vis., SUS @ 100° F.: 43.91
Rvp, psi @ 100° F.: 6.4
Hydrogen sulfide, ppm: 102
NC_4 & lighter, wt %: 1.2

Light straight run
Range, °F.: 60-200
Yield, vol %: 9.1
Total sulfur, wt %: 0.046
RON clear: 62.6
RON + 3 ml TEL/gal: 82.4

Naphtha
Range, °F.: 60-400
Yield, vol %: 29.9
Paraffins, vol %: 64.40
Naphthenes, vol %: 21.02
Aromatics, vol %: 14.58
Total sulfur, wt %: 0.054
RON clear: 44.5
RON + 3 ml TEL/gal: 67.0

Kerosine
Range, °F.: 400-500
Yield, vol %: 12.5
Gravity, °API: 41.2
Freezing point, °F.: −36
P/N/A, vol %: 47.4/30.9/21.7
Total sulfur, wt %: 0.23
Aniline pt, °F.: 143.2
Smoke pt, mm: 22

Light gas oil
Range, °F.: 500-650
Yield, vol %: 16.0
Gravity, °API: 32.3
Pour pt, °F.: +25
P/N/A, vol %: 41.2/33.3/25.5
Total sulfur, wt %: 1.19
Carbon residue, Rams., wt %: 0.01
Aniline pt, °F.: 156.3
Cetane index: 52.5

Topped crude
Range, °F.: 650+
Yield, vol %: 40.4
Gravity, °API: 15.5
Vis., SUS @ 210° F.: 145.47
Vis., SUS @ 122° F.: 149.53
Pour pt, °F.: +55
Total sulfur, wt %: 2.94
Carbon residue, Rams., wt %: 8.08
Nitrogen, %: 0.2065
Ni/V, ppm: 14.8/67.1

Vacuum gas oil
Range, °F.: 650-1,100+
Yield, vol % (of crude): 28.5
Gravity, °API: 19.7
Aniline pt, °F.: 181.1
Vis., SUS @ 130° F.: 207.09
Pour pt, °F.: +110
Sulfur, wt %: 2.45
Carbon residue, Rams., wt %: 0.97
Ni/V, ppm: 4.3/-

Vacuum residue
Range, °F.: 1,100+
Yield, vol % (of crude): 11.9
Gravity, °API: 4.2
Vis., SFS @ 275° F.: 235.8
Sulfur, wt %: 4.18
Carbon residue, wt %: 23.08
Ni/V, ppm: 37/210

Lagomedio, Venezuela

Punta Palmas, Puerto Miranda/La Salina, Lake Maracaibo

Crude
Gravity, °API: 31.50
Sulfur, wt %: 1.17
Vis., SUS @ 100° F.: 56
Pour pt, °F.: −15
Rvp: 5.3
Yield, 0°(IVT) - −82° F., vol %: 1.96

Light naphtha
Range, °F.: 82-200
Yield, vol %: 6.10
Paraffins, %: 77.35
Naphthenes, %: 20.38
Aromatics, %: 2.28
RON clear: 65.6

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 9.27
Sulfur, wt %: 0.0
P/N/A, %: 55.4/33.0/11.5

Naphtha
Range, °F.: 300-350
Yield, vol %: 5.0
P/N/A, %: 50.0/32.5/17.5

Kerosine
Range, °F.: 350-400
Yield, vol %: 4.95
Sulfur, wt %: 0.027
Aromatics, %: 19.5
Smoke pt, mm: 24.5
Cetane no.: 56.12
Cetane index: 47.2

Gas oil
Range, °F.: 400-500
Yield, vol %: 9.39
Gravity, °API: 40.65
Sulfur, wt %: 0.17
Aromatics, %: 19.7
Smoke pt, mm: 20.61
Cetane no.: 50.02
Aniline pt, °F.: 147.34
Cetane index: 50.3

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.69
Gravity, °API: 36.9
Sulfur, wt %: 0.44

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.49
Gravity, °API: 33.4
Sulfur, wt %: 0.78
Cetane no.: 54.81
Aniline pt, °F.: 166.46
Cetane index: 58.1

Residue
Range, °F.: 650+
Yield, vol %: 49.15
Gravity, °API: 18.16
Sulfur, wt %: 1.97
Ni/V, ppm: 20/180

La Rosa Medium, Venezuela

La Salina, Lake Maracaibo

Crude
Gravity, °API: 25.3
Sulfur, wt %: 1.73
Pour pt, °F.: < −50
Rvp, psi: 4.0
Neut. no., mg KOH/g: 0.90
Vis. kin., cSt @ 122° F.: 24.0
Yield, C_5 & lighter: 1.34

Distillation

°F.	Yield, vol %: On crude	Cum.
C_2-C_5	1.34	1.34
158	2.47	3.80
212	2.33	6.13
302	5.40	11.52
401	6.69	18.21
509	7.81	26.01
650	13.22	39.23
698	5.63	44.85
752	6.33	51.17
752+	48.83	100.00

Residue
Range, °F.: 752+
Yield, vol %: 48.83
Gravity, °API: 12.1
Sulfur, wt %: 2.63
Con. carbon, wt %: 12.85
V/Ni, ppm: 413/43
Kin. vis., cSt @ 140° F.: 2,397

Leona, Venezuela

Puerto La Cruz, State of Anzoategui

Crude
Gravity, °API: 24.1
Sulfur, wt %: 1.5
Vis., SUS @ 122° F.: 305
Pour pt, °F.: −45
Rvp: 5.5
Yield, 0°(IVT)-82° F., vol %: 0.99

Naphtha
Range, °F.: 82-200
Yield, vol %: 4.34
RON clear: 63.9

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 6.71
Sulfur, wt %: 0.005
Paraffins, %: 49.85
Naphthenes, %: 32.13
Aromatics, %: 18.01

Naphtha
Range, °F.: 300-350
Yield, vol %: 3.34

Kerosine
Range, °F.: 350-400
Yield, vol %: 3.39
Sulfur, wt %: 0.05
P/N/A, %: 34.6/43.9/21.5
Smoke pt, mm: 18.15
Cetane no.: 44.78
Aniline pt, °F.: 135.13
Cetane index: 43.23

Gas oil
Range, °F.: 400-500
Yield, vol %: 10.51
Gravity, °API: 36.39
Sulfur, wt %: 0.19
Smoke pt, mm: 16.14
Cetane no.: 50.18
Aniline pt, °F.: 149.11
Cetane index: 46.50

Gas oil
Range, °F.: 500-550
Yield, vol %: 5.31
Sulfur, wt %: 0.56

Gas oil
Range, °F.: 550-650
Yield, vol %: 10.32
Gravity, °API: 28.46
Sulfur, wt %: 0.92
Pour pt, °F.: 17.79

Residue
Range, °F.: 650+
Yield, vol %: 55.11
Gravity, °API: 12.28
Sulfur, wt %: 2.3
Ni/V, ppm: 26/176

Loreto, Peru

Puerto Bayovar

Crude
Gravity, °API: 34.0
Sulfur, wt %: 0.29
Pour pt, °F.: 34
Vis., SUS @ 80° F.: 53.3
V/Ni, ppm: 63/34

Light naphtha
Range, °C.: Ibp-45
Yield, vol %: 2.41

Naphtha
Range, °C.: 45-104
Yield, vol %: 7.11
Paraffins, vol %: 68.3
Naphthenes, vol %: 29.9
Aromatics, vol %: 1.8

Heavy naphtha
Range, °C.: 104-199
Yield, vol %: 18.24
P/N/A, vol %: 49.9/39.2/10.3

Kerosine
Range, °C.: 199-288
Yield, vol %: 18.95
Sulfur, wt %: 0.05
Pour pt, °C.: −37
Cetane index: 46.3

Residue
Range, °C.: 343+
Yield, vol %: 41.3
Gravity, °API: 18.9
Sulfur, wt %: 0.51

Maya, Mexico

Pajaritos, Veracruz and Salina Cruz (Pacific), Oaxaca

Crude
Gravity, °API @ 60° F.: 22.0
Sulfur, wt %: 3.32
Pour test, °F.: 0
Vis., SUS @ 70° F.: 1,024.57
Vis., SUS @ 100° F.: 333.62
Rvp, psi @ 100° F.: 4.7
Hydrogen sulfide, ppm: 199
NC_4 & lighter, vol %: 1.5

Light straight run
Range, °F.: 60-200
Yield, vol %: 5.2
Total sulfur, wt %: 0.025
RON clear: 57.7
RON + 3 ml TEL/gal: 80.9

Naphtha
Range, °F.: 60-400
Yield, vol %: 19.7
Paraffins, vol %: 60.60
Naphthenes, vol %: 27.03
Aromatics, vol %: 12.37
Total sulfur, wt %: 0.213
RON clear: 38.1
RON + 3 ml TEL/gal: 57.6

Kerosine
Range, °F.: 400-500
Yield, vol %: 9.6
Gravity, °API: 39.6
Freezing pt, °F.: −29
P/N/A, vol %: 45.4/33.7/20.9
Total sulfur, wt %: 1.16
Aniline pt, °F.: 142.2
Smoke pt, mm: 20

Light gas oil
Range, °F.: 500-650
Yield, vol %: 12.8
Gravity, °API: 30.6
Pour pt, °F.: +30
P/N/A, vol %: 36.8/34.1/29.1
Total sulfur, wt %: 2.17
Carbon residue, Rams., wt %: 0.08
Aniline pt, °F.: 152.8
Cetane index: 51.0

Topped crude
Range, °F.: 650+
Yield, vol %: 56.4
Gravity, °API: 7.7
Vis., SUS @ 210° F.: 3,370.63
Vis., SUS @ 122° F.: 23,755.00
Pour pt, °F.: +115
Total sulfur, wt %: 5.04
Carbon residue, Rams., wt %: 17.83
Nitrogen, %: 0.4245
Ni/V, ppm: 87.8/535.0

Vacuum gas oil
Range, °F.: 650-1,100+
Yield, vol % (of crude): 25.2
Gravity, °API: 18.3
Aniline pt, °F.: 167.4
Vis., SUS @ 130° F.: 270.17
Pour pt, °F.: +105
Sulfur, wt %: 3.14
Carbon residue, Rams., wt %: 0.69
Ni/V, ppm: 0.9/1.9

Vacuum residue
Range, °F.: 1,100+
Yield, vol % (of crude): 31.2
Gravity, °API: 0.5
Vis., SUS @ 275° F.: Too hard
Sulfur, wt %: 5.78
Carbon residue, Rams., wt %: 26.2
Ni/V, ppm: 149/913

Merey, Venezuela

Puerto La Cruz, State of Anzoategui

Crude
Gravity, °API: 17.4
Sulfur, wt %: 2.2
Vis., SUS @ 100° F.: 1,207
Pour pt, °F.: −10
Yield, 0°(IVT)-82° F., vol %: 0.54

Light naphtha
Range, °F.: 82-200
Yield, vol %: 1.61
RON clear: 74.7

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 3.21
Sulfur, wt %: 0.01
Paraffins, vol %: 43.9
Naphthenes, vol %: 41.55
Aromatics, vol %: 15.17

Naphtha
Range, °F.: 300-350
Yield, vol %: 1.91
Sulfur, wt %: 0.036
P/N/A, vol %: 43.19/42.30/14.50

Kerosine
Range, °F.: 350-400
Yield, vol %: 2.37
Sulfur, wt %: 0.09
Aromatics, vol %: 13.95
Smoke pt, mm: 21.37
Aniline pt, °F.: 126.6

Gas oil
Range, °F.: 400-500
Yield, vol %: 7.21
Gravity, °API: 34.89
Sulfur, wt %: 0.33
Aromatics, vol %: 17.10
Smoke pt, mm: 13.45
Cetane no.: 35.62
Aniline pt, °F.: 135.51
Cetane index: 38.94

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.52
Gravity, °API: 30.82
Sulfur, wt %: 0.7037

Gas oil
Range, °F.: 550-650
Yield, vol %: 10.47
Gravity, °API: 27.13
Sulfur, wt %: 1.15

Residue
Range, °F.: 650+
Yield, vol %: 68.16
Sulfur, wt %: 2.8
Ni/V, ppm: 74.77/301.08

Oriente, Ecuador

Puerto Balao/ Esmeraldas, Ecuador

Crude
Gravity, °API: 29.2
Sulfur, wt %: 1.01
Vis., cSt @ 104° F.: 13.0
Pour pt, °F.: 25.0
C_4 & lighter, vol %: 4.7
Rvp @ 100° F., psi: 3.70
Ni/V, ppm: 39/65

Light naphtha
Range, °F.: Ibp-200
Yield, vol %: 3.9
Sulfur, wt %: 0.001
Paraffins, vol %: 62.4
Naphthenes, vol %: 35.0
Aromatics, vol %: 2.6
RON clear: 67.3

heavy naphtha
Range, °F.: 200-400
Yield, vol %: 17.3
Sulfur, wt %: 0.01
P/N/A, vol %: 44.9/45.8/9.3
RON clear: 45.9
Aniline pt, °F.: 130

Kerosine
Range, °F.: 400-500
Yield, vol %: 6.4
Gravity, °API: 40.6
Sulfur, wt %: 0.16
Vis., cSt @ 104° F.: 1.78
Smoke pt, mm: 20
Freezing pt, °F.: −41
Aniline pt, °F.: 142

Gas oil
Range, °F.: 500-620
Yield, vol %: 14.7
Gravity, °API: 35.1
Sulfur, wt %: 0.49
Vis., cSt @ 104° F.: 3.33
Pour pt, °F.: 5
Aniline pt, °F.: 153

Vacuum gas oil
Range, °F.: 620-1,000
Yield, vol %: 32.0
Gravity, °API: 25.2
Sulfur, wt %: 1.[illegible]4
Vis., cSt @ 104° F.: 33.0
Pour pt, °F.: 90
Ni/V, ppm: 1/<1

Residue
Range, °F.: 620+
Yield, vol %: 51.5
Gravity, °API: 17.0
Sulfur, wt %: 1.66
Vis., cSt @ 104° F: 649
Vis., cSt @ 212° F.: 34.1

Tia Juana Light, Venezuela

La Salina, State of Zulia

Crude
Gravity, °API: 32.1
Sulfur, wt %: 1.1
Kin. vis., SSU @ 100° F.: 60
Pour pt, °F.: −45
Yield, 0°(IVT)-82° F., vol %: 2.16

Light naphtha
Range, °F.: 82-200
Yield, vol %: 5.19

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 10.82
Sulfur, wt %. 0.0017
Paraffins, %: 65.99
Naphthenes, %: 24.30
Aromatics, %: 9.71
RON clear: 53.6

Naphtha
Range, °F.: 300-350
Yield, vol %: 4.82
Sulfur, wt %: 0.0077
P/N/A, %: 51.23/31.69/17.08

Kerosine
Range, °F.: 350-400
Yield, vol %: 4.64
Sulfur, wt %: 0.0281
P/N/A, %: 45.77/35.64/18.58
Smoke pt, mm: 23.37
Aniline pt, °F.: 134.99

Gas oil
Range, °F.: 400-500
Yield, vol %: 10.41
Gravity, °API: 40.72
Sulfur, wt %: 0.11
Smoke pt, mm: 14.99
Aniline pt, °F.: 147.31
Cetane index: 50.43

Gas oil
Range, °F.: 500-550
Yield, vol %: 4.96
Gravity, °API: 36.17
Sulfur, wt %: 0.4540
Smoke pt, mm: 11.99
Aniline pt, °F.: 158.47

Gas oil
Range, °F.: 550-650
Yield, vol %: 9.25
Gravity, °API: 32.39
Sulfur, wt %: 0.78
Smoke pt, mm: 14.42
Aniline pt, °F.: 168.05

Residue
Range, °F.: 650+
Yield, vol %: 47.75
Gravity, °API: 16.46
Sulfur, wt %: 1.87
Ni/V, ppm: 26/224

Tia Juana Pesado (Heavy), Venezuela

Puerto Miranda, Lake Maracaibo

Crude
Gravity, °API: 12.10
Sulfur, wt %: 2.7
Kin. vis., cSt @ 122° F.: 2,983
Pour pt, °F.: 30
Yield, 0°(IVT)-82° F., vol %: 0.08

Naphtha
Range, °F.: 82-200
Yield, vol %: 0.10

Heavy naphtha
Range, °F.: 200-300
Yield, vol %: 0.53
Sulfur, wt %: 0.209

Naphtha
Range, °F.: 300-350
Yield, vol %: 0.52
Sulfur, wt %: 0.21

Kerosine
Range, °F.: 350-400
Yield, vol %: 0.90
Sulfur, wt %: 0.24
Aromatics, %: 13.31
Smoke pt, mm: 20.53
Aniline pt, °F.: 122.34

Gas oil
Range, °F.: 400-500
Yield, vol %: 4.52
Gravity, °API: 31.9
Sulfur, wt %: 0.6
Smoke pt, mm: 13.26
Aniline pt, °F.: 128.0
Cetane no.: 32.46
Cetane index: 33.27

Gas oil
Range, °F.: 500-550
Yield, vol %: 3.12
Sulfur, wt %: 0.93

Gas oil
Range, °F.: 550-650
Yield, vol %: 7.92
Gravity, °API: 22.96
Sulfur, wt %: 1.51

Residue
Range, °F.: 650+
Yield, vol %: 82.15
Gravity, °API: 8.94
Sulfur, wt %: 3.0
V, ppm: 532

Bombay High, India

Floating storage in Arabian Sea producing area

Crude
Gravity, °API: 39.35
Rvp @ 38° C., kg/sq cm: 0.34
Pour pt, °C.: +30
Kin. vis., cSt @ 40° C.: 3.28
Sulfur, wt %: 0.17
Salt content, lb/1,000 bbl: 11
Con. carbon, wt %: 1.2
Wax (E.H.), wt %: 10.6
Yield, vol %: 20.6
Gravity, °API: 58.42
Charac. factor K UOP: 11.7
V/Ni/Fe, ppm: 0.3/1.0/<0.3

Naphtha
Range, °C.: C_5–150
Yield, wt %: 18.6
Rvp, Kg/sq cm @ 38° C.: 0.42
Sulfur, total, ppm: 3.0
Mercaptan sulfur, ppm: 1.3
Paraffins, vol %: 53.7
Napthenes, vol %: 25.0
Aromatics, vol %: 21.3
RON, clear: 69.6
RON + 0.56 g Pb/l as TEL: 82.1

Kerosine
Range, °C.: 140–240
Yield, wt %: 19.3
Yield, vol %: 19.6
Gravity, °API: 43.75
Sulfur, total, ppm: 66
Mercaptan sulfur, ppm: 1.5
Flash pt, (Abel), °C.: 46.5
Smoke pt, mm: 19
Freezing pt, °C.: − 54.0
Aniline pt, °C.: 52.2
Kin. vis., cSt @ − 30° C.: 4.18
P/N/A, vol %: 39.8/23.9/26.3

Gas oil
Range, °C.: 240–370
Yield, wt %: 25.6
Yield, vol %: 25.2
Gravity, °API: 34.25
Pour pt, °C.: + 3
Kin. vis., cSt @ 37.8° C.: 4.17
Sulfur, total, wt %: 0.14
Aniline pt, °C.: 73.2
Diesel index: 56

Vacuum gas oil
Range, °C : 370–550
Yield, wt %: 29.3
Yield, vol %: 27.5
Gravity, °API: 29.86
Pour pt, °C.: + 51
Kin. vis., cSt @ 70° C.: 11.0
Kin. vis., cSt @ 98.9° C.: 5.65
Con. carbon, wt %: 0.17
Asphaltene, wt %: 0.06
V/Ni/Cu/Fe, ppm: <0.3/<0.3/<0.1/<0.3

Residue
Range, °C.: 370+
Yield, vol %: 34.6
Yield, vol %: 31.0
Gravity, °API: 21.24
Pour pt, °C.: + 51
Sulfur, total, wt %: 0.38
Kin. vis., cSt @ 98.9° C.: 14.37
Kin. vis., cSt @ 70° C.: 24.66
Con. carbon, wt %: 4.33
Asphaltene, wt %: 1.22
V/Ni/Cu/Fe, ppm: 0.8/2.8/<0.1/0.35

Residue
Range, °C.: 550+
Yield, wt %: 5.3
Yield, vol %: 3.5
Gravity, °API: 7.86
Pour pt, °C.: +78
Sulfur, total, wt %: 0.77
Kin. vis., cSt @ 98.9° C.: 1,396.58
Con. carbon, wt %: 23.70
Asphaltene, wt %: 8.40
V/Ni/Cu/Fe, ppm: 5.0/18.0/<0.1/1.9

North America

Bow River Heavy, Alberta

*Bow River Pipe Lines Ltd. to Edmonton**

Crude
Gravity, °API: 26.7
Sulfur, g/kg: 21.0
Rvp, kPa: 37.2
Pour pt, °C.: −50.0
Con. carbon, wt %: 6.70
Vis., cSt @ 40° C.: 18.30
Ni/V, wt ppm: 20.7/54.0
C_3, yield, vol %: 0.41
C_4s, yield, vol %: 1.47

Naphtha
Range, °C.: C_5-190
Yield, vol %: 20.40
Sulfur, g/kg: 0.61
Paraffins, vol %: 65.50
Olefins, vol %: 0.40
Naphthenes, vol %: 26.80
Aromatics, vol %: 7.30

Kerosine
Range, °C.: 190-277
Yield, vol %: 13.10
Sulfur, g/kg: 4.40
P/O/N/A, vol %: 73.20/2.60/0.00/24.20
Aniline pt, °C.: 57.7
Pour pt, °C.: −60.6
Cetane no.: 44.0
Cetane index: 52.3
Smoke pt, mm: 27.0

Distillate
Range, °C.: 277-343
Yield, vol %: 10.80
Gravity, °API: 29.6
Sulfur, g/kg: 10.30
Aromatics, vol %: 55.10
Aniline pt, °C.: 63.9
Pour pt, °C.: − 35.0
Cetane no.: 46.0
Cetane index: 49.6
Vis., cSt @ 38° C.: 5.57

Gas oil
Range, °C.: 343-565°
Yield, vol %: 32.50
Gravity, °API: 20.9
Sulfur, g/kg: 21.00
Total nitrogen, wt %: 0.03
Pour pt, °C.: 12.1
Con. carbon, wt %: 0.60
Vis. cSt @ 38° C.: 57.30
Ni/V, ppm: 0.00/0.12

Residue
Range, °C.: 565+
Yield, vol %: 23.20
Gravity, °API: 5.3
Sulfur, g/kg: 38.20
Pour pt, °C.: 73.0
Vis., cSt @ 135° C.: 940
Penetration @ 25° C.: 19
Ni/V, wt ppm: 67.70/169.00

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton

Cold Lake,* Alberta

Alberta Oil Sands Pipeline Ltd. to Edmonton†

Crude
Density, g/cu cm: 0.9031
Sulfur, wt %: 2.91
Vis., cSt @ 15° C.: 70.7

Neut. No.: 0.71
Nitrogen, wt %: 0.29
Pour pt, °C.: – 60
C_5 & lighter yield, vol %: 7.43

Naphtha
Range, °C.: 20-175
Yield, vol %: 30.0
RON clear: 63.7
Sulfur, wt %: 0.06

Distillate
Range, °C.: 175-295
Yield, vol %: 10.5
Density, kg/cu cm: 0.7983
Sulfur, wt %: 0.76
Aniline pt, °C.: 56
Vis., cSt @ 40° C.: 2.0
Freezing pt, °C.: – 61.5
Pour pt, °C.: – 51
Smoke pt, °C.: 18.4

Gas oil
Range, °C.: 343-517
Yield, vol %: 18.7
Density, kg/cu cm @ 15° C.: 0.9536
Sulfur, wt %: 2.96
Nitrogen, wt %: 0.08
Ni/V, wt ppm: 0.05/0.15

Residuum
Range, °C.: 343+
Yield, vol %: 51.6
Density, kg/cu cm: 1.0203
Sulfur, wt %: 4.8
Vis., cSt @ 60° C.: 7,750
Pour pt, °C.: +51
Ni/V/Fe, wt ppm: 90.6/213.7/12.8

Asphalt
Range, °C.: 405+
Yield, vol %: 47.8
Density @ 15° C., kg/cu m: 1,030.7
Pen. @ 25° C. (100/5): 343
Pen. @ 4° C. (100/5): 36
Pen. index: – 1.01
Vis. @ 60° C., Poises: 298
Vis. @ 100° C., cSt: 994

Asphalt
Range, °C.: 470+
Yield, vol %: 37.7
Density @ 15° C., kg/cu m: 1,046.9
Pen. @ 25° C. (100/5): 60
Pen. @ 4° C. (100/5): 6
Pen. index: – 0.46
Vis. @ 60° C., Poises: 3,576
Vis. @ 100° C., cSt: 4,894

*Diluent added to crude to permit pipeline transportation. This assay made on blend of 28 wt % mixed condensate (gravity, °API, 58.9) and 72 wt % Cold Lake Crude that had the following characteristics:

Gravity, °API: 13.2
Density @ 15° C.: 0.9770
Sulfur, wt %: 4.11
Nitrogen, wt %: 0.42
Pour pt, °C.: – 4
Vis., cSt @ 40° C.: 1,057
Vis., cSt @ 80° C.: 98

†Has access to Interprovincial and Trans Mountain pipelines at Edmonton

Federated Light and Medium, Alberta

*Federated Pipe Line Ltd. to Edmonton**

Crude
Gravity, °API: 39.7
Sulfur, g/kg: 2.01
Total nitrogen, wt %: 0.11
Rvp, kPa: 31.0
Pour pt, °C.: – 10.0
Con. carbon, wt %: 1.46
Vis. cSt @ 40° C.: 3.30
Wax, wt %: 9.12
Neut. value, mg: 0.00
Ni/V, ppm: 0.07/0.00
C_4 & lighter, vol %: 3.43

Naphtha
Range, °C.: C_5-190
Yield, vol %: 30.90
Sulfur, g/kg: 0.05
Paraffins, vol %: 28.30
Naphthenes, vol %: 54.90
Aromatics, vol %: 16.80
RON clear: 56.4

Kerosine
Range, °C.: 190-277
Yield, vol %: 18.25
Gravity, °API: 41.0
Sulfur, g/kg: 0.68
Aromatics, vol %: 23.00
Aniline pt, °C.: 142.0
Pour pt, °C.: – 40.0
Freezing pt, °C.: – 39.0
Cetane no.: 47.0

Distillate
Range, °C.: 277-343
Yield, vol %: 13.73
Gravity, °API: 34.6
Sulfur, g/kg: 1.97
Aniline pt, °C.: 80.7
Pour pt, °C.: – 7.5
Cetane no.: 55.0
Cetane index: 49.0
Vis., cSt @ 38° C.: 4.43

Gas oil
Range, °C.: 343-565
Yield, vol %: 28.29
Gravity, °API: 25.6
Sulfur, g/kg: 3.10
Total nitrogen, wt %: 0.16
Pour pt, °C.: 40.0
Con. carbon, wt %: 0.45
Vis., cSt @ 50° C.: 29.32
Ni/V, wt ppm: 1.24/0.00

Residue
Range, °C.: 565+
Yield, vol %: 8.83
Gravity, °API: 15.2
Sulfur, g/kg: 5.40
Pour pt, °C.: 26.0
Vis., cSt @ 135° C.: 30.64
Ni/V, wt ppm: 9.50/5.70

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton.

Gulf Alberta, L & M

*Gulf Alberta Pipeline to Edmonton**

Crude
Gravity, °API: 35.1
Sulfur, g/kg: 9.80
H_2S, wt ppm: 58.1
Rvp, kPa: 36.4
Pour pt, °C.: – 27.5
Vis., cSt @ 40° C.: 4.86
Ni/V, wt ppm: 10.10/9.00
C_4 & lighter, yield, vol %: 3.50

Naphtha
Range, °C.: C_5-190
Yield, vol %: 30.60
Sulfur, g/kg: 0.36
Paraffins, vol %: 56.04
Olefins, vol %: 0.00
Naphthenes, vol %: 31.53
Aromatics, vol %: 12.43

Kerosine
Range, °C.: 190-277
Yield, vol %: 14.20
Gravity, °API: 39.9
Sulfur, g/kg: 2.76
Aromatics, vol %: 28.13
Aniline pt, °C.: 59.7
Pour pt, °C.: – 40.0
Cetane no.: 46.0
Cetane index: 49.0
Smoke pt, mm: 19.0

Distillate
Range, °C.: 277-343
Yield, vol %: 8.53
Gravity, °API: 22.1
Sulfur, g/kg: 7.67
Aniline pt, °C.: 70.0
Pour pt, °C.: – 10.0
Cetane no.: 52.0
Cetane index: 55.0
Vis., cSt @ 38° C.: 5.14

Gas oil
Range, °C.: 343-565
Yield, vol %: 31.43
Gravity, °API: 23.8
Sulfur, g/kg: 12.72
Total nitrogen, wt %: 0.13
Pour pt, °C.: 31.0
Con. carbon, wt %: 0.23
Vis., cSt @ 38° C.: 44.22
Ni/V, ppm: 0.40/0.00

Residue
Range, °C.: 565+
Yield, vol %: 15.2
Gravity, °API: 14.6
Sulfur, g/kg: 23.87
Pour pt, °C.: 44.0
Vis., cSt @ 135° C.: 59.97
Ni/V, wt ppm: 24.10/25.10

*Access to Interprovincial and Trans Mountain pipelines at Edmonton.

Lloydminster,* Alberta and Saskatchewan

Husky Oil Operations Ltd. pipeline to Hardisty, Alta.†

Crude
Gravity, °API: 20.7
Sulfur, g/kg: 31.5
Rvp, kPa: 30.3
Pour pt, °C.: – 32.0
Con. carbon, wt %: 9.18
Vis., cSt @ 40° C.: 101.00
Neut. value, mg: 0.78
Ni/V, wt ppm: 52.70/10.50
C_4 & lighter, yield, vol %: 0.48

Naphtha
Range: C_5-190°
Yield, vol %: 19.50
Sulfur, g/kg: 0.79
Paraffins, vol %: 55.10
Olefins, vol %: 1.50
Naphthenes, vol %: 31.60
Aromatics, vol %: 11.80

Kerosine
Range, °C.: 190-277
Yield, vol %: 9.80
Gravity, °API: 34.9
Sulfur, g/kg: 5.05
Aromatics, vol %: 22.40
Aniline pt, °C.: 52.4
Pour pt, °C.: – 63.3
Cetane no.: 35.0
Smoke pt, mm: 19.0

Distillate
Range, °C.: 277-343
Yield, vol %: 9.50

Gravity, °API: 26.5
Sulfur, g/kg: 8.45
Aromatics, vol %: 38.90
Aniline pt, °C.: 56.5
Pour pt, °C.: − 31.1
Cetane no.: 40.0
Cetane index: 41.5
Vis., cSt @ 38° C.: 6.32

Gas oil
Range, °C.: 343-565
Yield, vol %: 25.20
Gravity, °API: 17.5
Sulfur, g/kg: 28.50
Aniline pt, °C.: 72.2
Pour pt, °C.: 1.7
Con. carbon, wt %: 0.55
Vis., cSt @ 38° C.: 155.00
Ni/V, wt ppm: 0.00/0.10

Residue
Range, °C.: 565 +
Yield, vol %: 36.00
Gravity, °API: 2.9
Sulfur, g/kg: 56.90
Pour pt, °C.: 69.0
Con. carbon, wt %: 25.10
Vis., cSt @ 135° C.: 3,260
Ni/V, wt ppm: 123/231

*Crude has been blended with pipeline condensate to permit transportation. Typically 20-25% condensate is added to crude.
†Has access to Interprovincial pipeline at Hardisty.

Rainbow Light and Medium, Alberta

*Rainbow Pipe Line Co. Ltd. to Edmonton**

Crude
Gravity, °API: 40.7
Sulfur, g/kg: 5.00
H_2S, wt ppm: 10.2
Rvp, kPa: 33.9
Pour pt, °C.: 2.5
Con. carbon, wt %: 1.65
Vis., cSt @ 40° C.: 3.77
Wax, wt %: 20.40
Neut. value, mg: 0.08
Ni/V, wt ppm: 0.85/0.50
C_4 & lighter, yield, vol %: 3.40

Naphtha
Range, °C.: C_5-190
Yield, vol %: 38.70
Sulfur, g/kg: 0.14
Paraffins, vol %: 61.25
Naphthenes, vol %: 25.96
Aromatics, vol %: 12.79
RON clear: 51.2
MON clear: 51.4

Kerosine
Range, °C.: 190-277
Yield, vol %: 13.00
Gravity, °API: 42.2
Sulfur, g/kg: 1.20
Aromatics, vol %: 24.23
Aniline pt, °C.: 62.3
Pour pt, °C.: − 37.5
Freezing pt, °C.: − 35.0
Cetane no.: 46.0
Cetane index: 47.8
Smoke pt, mm: 20.0
Vis., cSt @ 40° C.: 1.55

Distillate
Range, °C.: 277-343
Yield, vol %: 11.50
Gravity, °API: 35.0
Sulfur, g/kg: 4.40
Aniline pt. °C.: 75.5
Pour pt, °C.: − 5.0
Cetane no.: 59.0
Cetane index: 55.0
Vis., cSt @ 38° C.: 4.51

Gas oil
Range, °C.: 343-565
Yield, vol %: 31.65
Sulfur, g/kg: 8.04
Total nitrogen, wt %: 0.69
Pour pt, °C.: 26.0
Con. carbon, wt %: 0.16
Vis., cSt @ 50° C.: 20.39
Asphaltenes, vol %: 4.10
Ni/V, wt ppm: 0.02/0.00

Residue
Range, °C.: 565 +
Yield, vol %: 5.15
Gravity, °API: 19.6
Sulfur, g/kg: 10.71
Total nitrogen, wt %: 3.22
Pour pt, °C.: 28.0
Con. carbon, wt %: 11.11
Vis., cSt @ 135° C.: 27.82
Asphaltenes, wt %: 13.42
Ni/V, wt ppm: 4.60/2.90

*Has access to Interprovincial and Trans Mountain pipelines at Edmonton.

Rangeland-South L & M, Alberta

Rangeland Pipe Line Co. to Canadian/U.S. border near Carway, Alta.

Crude
Gravity, °API: 39.5
Sulfur, g/kg: 7.52
H_2S, wt ppm: 20.1
Rvp, kPa: 39.3
Pour pt, °C.: − 40.0
Con. carbon, wt %: 0.69
Vis., cSt @ 40° C.: 2.67
Wax, wt %: 12.44
Neut. value, mg: 0.12
Ni/V, wt ppm: 1.20/1.40
C_4 & lighter, yield, wt %: 3.22

Naphtha
Range, °C.: C_5-190
Yield, vol %: 38.75
Sulfur, g/kg: 0.12
Rvp, kPa: 41.1
Paraffins, vol %: 42.45
Naphthenes, vol %: 36.86
Aromatics, vol %: 20.69
RON clear: 58.5
MON clear: 57.3

Kerosine
Range, °C.: 190-277
Yield, vol %: 15.50
Gravity, °API: 38.3
Sulfur, g/kg: 1.87
Aromatics, vol %: 24.0
Aniline pt, °C.: 62.0
Pour pt, °C.: − 37.5
Freezing pt, °C.: − 28.5
Cetane no.: 48.0
Smoke pt, mm: 20.0

Distillate
Range, °C.: 277-343
Yield, vol %: 8.55
Gravity, °API: 32.0
Sulfur, g/kg: 4.79
Aniline pt, °C.: 71.0
Pour pt, °C.: − 7.5
Cetane no.: 51.0
Cetane index: 52.0
Vis., cSt @ 38° C.: 5.24

Gas oil
Range, °C.: 343-565
Yield, vol %: 33.20
Gravity, °API: 26.5
Sulfur, g/kg: 11.64
Total nitrogen, wt %: 0.62
Aniline pt, °C.: 86.6
Pour pt, °C.: 24.0
Con. carbon, wt %: 0.10
Vis., cSt @ 38° C.: 42.02

Residue
Range, °C.: 565 +
Yield, vol %: 4.0
Gravity, °API: 21.7
Sulfur, g/kg: 12.19
Pour pt, °C.: 27.5
Vis., cSt @ 135° C.: 18.75
Asphaltenes, wt %: 10.13
Ni/V, wt ppm: 3.0/7.4

Wainwright—Kinsella,* Alberta

Husky Oil Operations Ltd. pipeline to Hardisty, Alta.†

Crude
Gravity, °API: 23.1
Sulfur, g/kg: 15.80
Rvp, kPa: 30.3
Pour pt, °C.: − 39.0
Con. carbon, wt %: 6.70
Vis., cSt @ 40° C.: 32.50
Ni/V, ppm: 40.30/79.90

Naphtha
Range, °C: C_5-190
Yield, vol %: 19.0
Sulfur, g/kg: 0.50
Paraffins, vol %: 52.50
Naphthenes, vol %: 37.80
Aromatics, vol %: 8.90

Kerosine
Range, °C.: 190-277
Yield, vol %: 12.00
Gravity, °API: 36.3
Sulfur, g/kg: 3.44
Aromatics, vol %: 22.80
Aniline pt, °C.: 56.7
Freezing pt, °C.: − 51.6
Cetane no.: 37.0
Smoke pt, mm: 26.0

Distillate
Range, °C.: 277-343
Yield, vol %: 11.0
Gravity, °API: 28.1
Sulfur, g/kg: 10.50
Aromatics, vol %: 33.70
Aniline pt, °C.: 60.5
Pour pt, °C.: − 22.0
Cetane no.: 42.0
Cetane index: 43.9
Vis., cSt @ 38° C.: 5.69

Gas oil
Range, °C.: 343-565
Yield, vol %: 26.00
Gravity, °API: 19.1
Sulfur, g/kg: 21.80
Total nitrogen, wt %: 0.03
Pour pt, °C.: 12.8
Vis., cSt @ 38° C.: 131.0
Con. carbon, wt %: 0.55
Ni/V, wt ppm: 0.11/0.00

Residue
Range, °C.: 565+
Yield, vol %: 32.0
Gravity, °API: 3.7
Sulfur, g/kg: 52.60
Pour pt, °C.: 74.0
Vis., cSt @ 135° C.: 212.00
Asphaltenes, wt %: 19.10
Ni/V, ppm: 110/222

*Note: crude blended with condensate to permit transportation.
†Has access to Interprovincial Pipeline.

U.S.

Alaska North Slope (ANS, Sadlerochit)

Trans Alaska Pipeline to Valdez Terminal

Crude
Gravity, °API: 26.4
Sulfur, wt %: 1.06
Pour pt, °F.: 0
Rvp, psi: 3.55
Kin. vis. @ 60° F.: 42.42
H_2S, lb/1,000 bbl: 0.35
Salt, lb/1,000 bbl: 32.7
Carbon residue, wt %: 4.40
Neut. no. (D974): 1.12
Ni/V, ppm: 11/26
Nitrogen, ppm: 2,090
C_4 & lighter, yield, vol %: 1.17

Light gasoline
Range, °F.: C_5—150
Yield, vol %: 2.2
Sulfur, wt %: <0.001
RON clear: 71.5
MON clear: 69.8
RON + 0.5g TEL/gal: 78.4

Naphtha
Range, °F.: 150—380
Yield, vol %: 15.6
Sulfur, wt %: 0.013
Paraffins, vol %: 39.7
Naphthenes, vol %: 43.3
Aromatics, vol %: 17.0

Distillate
Range, °F.: 380—650
Yield, vol %: 28.6
Gravity, °API: 33.1
Sulfur, wt %: 0.414
Pour pt, °F.: − 25
Cetane No.: 45.8
Total N_2, ppm: 79
Aromatics, vol %: 33.6

Blended gas oil
Range, °F.: 650—840
Yield, vol %: 16.4
Gravity, °API: 23.8
Sulfur, wt %: 1.10
Aniline pt, °C.: 74.7
Pour pt, °F.: 70
Carbon residue, %: 0.012
Total nitrogen, ppm: 950
Basic nitrogen: 0.03

Residue
Range, °F.: 650+
Yield, vol %: 52.4
Gravity, °API: 15.0
Sulfur, wt %: 1.63
Carbon residue, %: 8.82
Total nitrogen, ppm: 3,600
Pour pt, °F.: 80
Kin. vis. @ 210° F.: 47.54
Kin. vis. @ 275° F.: 15.55

Note: This assay is of Sadlerochit crude, originally the only component of North Slope crude. Kuparuk crude is now blended at a rate of about 120,000 b/d with Sadlerochit at pumpstation No. 1. Total ANS stream is about 1.6 million b/d. See Kuparuk analysis in this section.

Kuparuk,* Alaska

Trans Alaska Pipeline to Valdez Terminal

Crude
Gravity, °API: 23.0
Sulfur, wt %: 1.76
Pour pt, °F.: − 55
Rvp, psi: 2.6
Kin. vis. @ 60° F., cSt: 79.98
H_2S, lb/1,000 bbl: <5
Carbon residue, wt %: 7.37
Ni/V, ppm: 19/57
Nitrogen, ppm: 1,980
C_5 & lighter, vol %: 2.12

Light gasoline
Range (TBP), °F.: C_5—150
Yield, vol %: 1.6
Sulfur, wt %: 0.006

Naphtha
Range, °F.: 150—380
Yield, vol %: 14.5
Sulfur, wt %: 0.018
Paraffins, vol %: 38.3
Naphthenes, vol %: 47.0
Aromatics, vol %: 14.7

Distillate
Range, °F.: 380—650
Yield, vol %: 26.9
Sulfur, wt %: 0.66
Pour pt, °F.: − 25
Cetane No.: 45.4
Vis., cSt @ 100° F.: 3.083
Aromatics, wt %: 30.0

Gas oil
Range, °F.: 650—840
Yield, vol %: 18.9
Gravity, °API: 20.5
Sulfur, wt %: 1.79
Aniline pt, °C.: 104.3
Pour pt, °F.: 50
Kin. vis. @ 100° F.: 34.20
Carbon residue, wt %: 0.01
Total nitrogen, ppm: 600
Basic nitrogen, wt %: 0.02
V/Ni, ppm: <1

Residue
Range, °F.: 650+
Yield, vol %: 56.0
Gravity, °API: 11.7
Sulfur, wt %: 2.59
Carbon residue, wt %: 12.61
Pour pt, °F.: 40
Kin. vis. @ 210° F.: 97.15

*About 120,000 b/d of Kuparuk is blended with some 1.6 million b/d of Sadlerochit crude to produce North Slope crude. Kuparuk contribution is expected to double by early 1985.

West Sak,* Alaska

Not in production

Crude
Gravity, °API: 22.4
Sulfur, wt %: 1.82
Pour pt, °F.: − 50
Rvp, psi: 2.70
Kin. vis. @ 60° F.: 95.92
Carbon residue, wt %: 7.62
Ni/V, ppm: 22/61
Neut. no. (D974): 0.68
C_4 & lighter, yield, vol %: 0.63

Light gasoline
Range, °F.: C_5—150
Yield, vol %: 1.9
Sulfur, wt %: 0.004

Naphtha
Range, °F.: 150—380
Yield, vol %: 14.4
Sulfur, wt %: 0.018
Paraffins, vol %: 36.4
Naphthenes, vol %: 48.2
Aromatics, vol %: 15.4

Distillate
Range, °F.: 380—650
Yield, vol %: 27.5
Gravity, °API: 31.6
Sulfur, wt %: 0.700
Pour pt, °F.: − 35
Cetane no.: 42.1
Aromatics, vol %: 31.4
Vis., cSt @ 100° F.: 3.34

Gas oil
Range, °F.: 650—840
Yield, vol %: 16.6
Gravity, °API: 21.1
Sulfur, wt %: 1.81
Pour pt, °F.: 60
Kin. vis. @ 100° F.: 43.99
Total nitrogen, ppm: 840
Basic nitrogen: 0.023

Residue
Range, °F.: 650+
Yield, vol %: 55.6
Gravity, °API: 10.8
Sulfur, wt %: 2.53
Carbon residue, wt %: 13.15
Pour pt, °F.: 45
Kin. vis. @ 210° F.: 135.3
Pentane insoluble, wt %: 14.97

*Crude not in production, but pilot program is underway in Kuparuk area to determine feasibility. Assay sample obtained during drill stem test.

Crude oil streams by country of origin*

Abu Dhabi, U.A.E.
Abu Al Bu Khoosh—Cie. Francaise des Petroles
Murban—Abu Dhabi National Oil Co.
Umm Shaif (Abu Dhabi Marine)—Adnoc
Zakum (Lower Zakum)—Adnoc

Algeria
Saharan Blend—Sonatrach
Zarzaitine—Sonatrach

Angola
Cabinda—Cabinda Gulf Oil Co.
Soyo Blend—Cia. de Petroles de Angola and Texaco Angola

Brunei
Champion Export—Brunei Shell
Seria Light—Brunei Shell

Cameroon
Kole Marine Blend—Elf Serepca

Canada
Bow River Heavy—Alberta Petroleum Marketing Commission
Cold Lake—Esso Petroleum Canada/APMC
Federated—APMC/Home Oil Ltd.
Gulf Alberta L & M—APMC/Gulf Canada
LLoydminster—Husky Oil Operations Ltd.
Rainbow Light & Medium—APMC/Mobil Oil Canada
Rangeland South—APMC/Dome Petroleum Ltd.
Wainwright-Kinsella—APMC/Husky Oil Operations Ltd.

China
Shengli—Petroleum Corp. of PRC
Taching (Daqing)—Petroleum Corp. of PRC

Congo (Brazzaville)
Djeno Blend (Djeno Melange)—Elf Congo

Denmark
Dan—Dansk Undergrunds Consortium (DUC)
Gorm—DUC

Divided Zone
Burgan (Wafra)—Getty and Kuwait Oil Co.
Eocene (Wafra)—Getty and Kuwait Oil Co.
Hout—Arabian Oil Co.
Khafji—AOC

Dubai, U.A.E
Dubai (Fateh)—Dubai Petroleum Co.

Ecuador
Oriente—Texaco

Egypt
Belayim—AGIP
Gulf of Suez Mix—Amoco

Gabon
Gamba—Elf Gabon
Lucina Marine—Elf Gabon
Mandji—Elf Gabon

Ghana
Salt Pond—Agri-Petco

India
Bombay High—Oil & Natural Gas Commission

Indonesia
Ardjuna—Atlantic Richfield Indonesia Inc.
Arimbi—ARCO Indonesia
Attaka—Union Oil Co. of Indonesia
Badak—Roy M. Huffington Inc.
Bekapai—Total Indonesie
Bunyu—Pertamina
Cinta—Independent Indonesian American Petroleum Co.
Duri (Sumatran Heavy)—Caltex Pacific Indonesia
Handil—Total Indonesie
Jatibarang—Pertamina
Minas (Sumatran Light)—Caltex Pacific Indonesia
Salawati—Phillips Petroleum Co., Indonesia
Sanga Sanga—Tesoro
Sepinggan—Yakin Mixed (4:1)—Union Oil Co. of Indonesia
Udang—Conoco of Indonesia
Walio—Petromer Trend Corp.

Iran
Aboozar (Ardeshir)—National Iranian Oil Co.
Bahrgansar/Nowruz (Sirip Blend)—NIOC
Dorrood (Darius)—NIOC
Foroozan (Fereidoon)—NIOC
Iranian Heavy—NIOC
Iranian Light—NIOC
Rostam—NIOC
Salmon (Sassan)—NIOC
Sirri—NIOC
Soroosh (Cyrus), Iran—NIOC

Iraq
Basrah Heavy—Iraq National Oil Co.
Basrah Light—INOC
Basrah Medium—INOC
Kirkuk Blend—INOC

Ivory Coast
Espoir—Phillips Petroleum Co. Ivory Coast

Kuwait
Kuwait—Kuwait Oil Co.

Libya
Amna (high pour)—Libyan National Oil Corp.
Brega—LNOC
Bu Attifel—AGIP
Es Sider—Oasis
Sarir—LNOC
Sirtica—LNOC
Zueitina—Occidental

Malaysia
Bekok—Esso Malaysia
Bintulu—Shell Malaysia
Labuan Blend—Shell Malaysia
Miri Light—Shell Malaysia
Pulai—Esso Malaysia
Tapis—Esso Malaysia
Tapis Blend—Esso Malaysia
Tembungo—Esso Malaysia

Mexico
Isthmus—Pemex
Maya—Pemex

Nigeria
Bonny Light—Shell
Bonny Medium—Shell
Brass River—Phillips Oil Co. (Nigeria)
Escravos—Gulf Oil Co. (Nigeria)
Forcados Blend—Shell
Pennington—Texaco Overseas (Nigeria)
Qua Iboe (Nigerian Light)—Mobil Oil Nigeria

Norway
Ekofisk—Phillips Petroleum
Gullfaks—Statoil
Murchison—Conoco
Statfjord—Mobil

Oman
Oman Export—Petroleum Development (Oman) Ltd. and Elf Group

Qatar
Dukhan (Qatar land)—Qatar General Petroleum Corp.
Qatar Marine—QGPC

Saudi Arabia
Arabian Heavy (Safaniya)—Arabian American Oil Co.
Arabian Light—Aramco
Arabian Light (Berri)—Aramco
Arabian Medium (Khursaniyah)—Aramco
Arabian Medium (Zuluf/Marjan)—Aramco

Sharjah, U.A.E
Mubarek—Buttes Resources Co.

Syria
Souedie—Syrian Petroleum Co.

Trinidad
Galeota Mix (Trinidad Blend)—Amoco

Tunisia
Ashtart—Elf Aquitaine
El Borma—AGIP

United Kingdom
Argyll—Hamilton Bros.
Auk—Shell/Esso
Beatrice—Britoil
Beryl—Mobil
Brae—Marathon
Brent—Shell/Esso
Brent Blend
Buchan—BP
Cormorant, North—Shell/Esso
Cormorant, South (Cormorant "A")—Shell/Esso
Dunlin—Shell/Esso
Flotta—Occidental/Texaco
Forties—BP
Fulmar—Shell/Esso
Magnus—BP
Maureen—Phillips Petroleum
Montrose—Amoco
Murchison—Conoco
Ninian Blend—Chevron/Union/BP
Statfjord—Conoco
Tartan—Texaco
Thistle—Britoil

U.S.
Alaska North Slope (ANS, Sadlerochit)—Sohio/Exxon/ARCO
Kuparuk—ARCO
West Sak—ARCO

U.S.S.R.
Soviet Export Blend—V/O Sojuznefteexport

Venezuela
BCF 24—Affiliate of Petroleos de Venezuela
Bachaquero—Affiliate of Petroleos de Venezuela
Boscan—Affiliate of Petroleos de Venezuela
Ceuta—Affiliate of Petroleos de Venezuela
Lagomedio—Affiliate of Petroleos de Venezuela
La Rosa—Affiliate of Petroleos de Venezuela
Leona—Affiliate of Petroleos de Venezuela
Merey—Affiliate of Petroleos de Venezuela
Tia Juana Light—Affiliate of Petroleos de Venezuela
Tia Juana Pesado—Affiliate of Petroleos de Venezuela

Zaire
Zaire—Zaire Gulf Oil Co.

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*Names in parentheses are former or secondary names of crudes. Companies listed are primary operators or sales contacts.

GUIDE TO EXPORT CRUDES FOR THE 80's

Colombia's Caño Limón crude ready for export

Richard Corbett
Refining Editor

The completion of the Caño Limón pipeline and offshore loading facilities last month put Colombia's new Caño Limón crude into the world crude oil trade. Operators of the field, Empresa Colombia de Petroleos (Ecopetrol), Occidental de Colombia Inc., and Shell de Colombia Inc., expect an initial tanker loading capability of 90,000 b/d with total capacity reaching 250,000 b/d in by July.

The crude oil will be loaded from a tanker-loading facility and a floating storage unit located offshore in the Carribean Sea at the Covenas marine terminal. The loading facility will have two CALM buoys each capable of handling 40,000 bbl/hr, and will be able to handle two shuttle tankers at once. Information regarding assays in this series, is in OGJ, Apr. 11, 1983.

Caño Limón, Colombia

Covenas terminal to two CALM in Carribean Sea

Crude
Gravity, °API: 30.8
Sulfur, wt %: 0.47
Salt, lb/1,000 bbl: 2.0
Pour pt., °F.: 60
Vis., cSt @ 100° F.: 12.54
Vis., cSt @ 120° F.: 8.19
Neut. No., mg KOH/g: 0.27
Rvp, psi: 0.7
H_2S, scf/100 gal crude: 0.02

Light naphtha
Range, °F.: IBP −220
Gravity, °API: 72.6
Yield, vol %: 3.94
Sulfur, wt %: 0.02
Mercaptan sulfur, vol %: 0.0002
Paraffins, vol %: 76.2
Naphthenes, vol %: 23.2
Aromatics, vol %: 0.6
Rvp, psi: 8.4

Naphtha
Range, °F.: 220-300
Gravity, °API: 59.3
Yield, vol %: 6.83
Sulfur, wt %: 0.01
Paraffins, vol %: 55.9
Naphthenes, vol %: 42.5
Aromatics, vol %: 1.6

Heavy naphtha
Range, °F.: 300-360
Gravity, °API: 51.9
Yield, vol %: 5.64
Sulfur, wt %: 0.01
Paraffins, vol %: 52.7
Naphthenes, vol %: 43.9
Aromatics, vol %: 3.4

Kerosine
Range, °F.: 360-500
Gravity, °API: 42.2
Yield, vol %: 21.09
Sulfur, wt %: 0.08
Mercaptan sulfur, vol %: 0.0004
Doctor: sweet
Smoke pt., mm: 22
Aniline pt., °F.: 163
Diesel index: 68.8
Pour pt., °F.: −60
W&N factor: 11.9
Vis., cSt @ 100° F.: 1.95

Light gas oil
Range, °F.: 500-700
Gravity, °API: 33.0
Yield, vol %: 22.04
Aniline pt., °F.: 182
Diesel index: 60.1
Pour pt., °F.: 30
Carbon residue, Rams., wt %: 0.08
Sulfur, wt %: 0.33
W&N factor: 11.9
Vis. cSt @ 100° F.: 7.16
Vis. cSt @ 210° F.: 2.04
Viscosity index: 82.4
Refractive index @ 67° C.: 1.4604
Basic nitrogen, wt %: 0.0081
Bromine No.: 5.7
V/Fe/Ni, ppm: 0.05/0.05/0.05

Atmospheric residuum
Range, °F.: 700+
Gravity, °API: 15.1
Yield, vol %: 39.89
Pour pt., °F.: 100
Carbon residue, Rams, wt %: 9.91
Sulfur, wt %: 0.84
W&N factor: 11.7
Vis., cSt @ 100° F.: 3,700.0
Vis., cSt @ 210° F.: 61.03
Viscosity index: 22.5

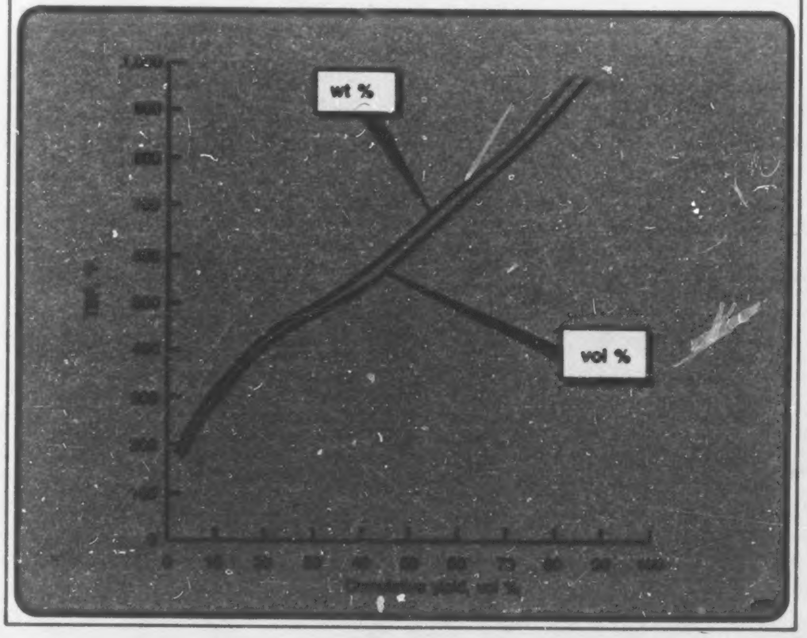
Vacuum gas oil
Range, °F.: 700-800
Gravity, °API: 26.5
Yield, vol %: 3.16
Aniline pt., °F.: 200
Diesel index: 53.0
Pour pt., °F.: 90
Carbon residue, Rams., wt %: 0.32
Sulfur, wt %: 0.52
W&N factor: 12.0
Vis., cSt @ 100° F.: 34.00
Vis., cSt @ 210° F.: 4.83
Viscosity index: 49.6
Refractive index @ 67° C.: 1.4766
Basic nitrogen, wt %: 0.0225
Bromine No.: 6.8
V/Fe/Ni, ppm: 0.05/0.20/1.40

Vacuum gas oil
Range, °F.: 800-1,000
Gravity, °API: 24.1
Yield, vol %: 15.01
Aniline pt., °F.: 210
Diesel index: 50.6
Pour pt., °F.: 105
Carbon residue, Rams, wt %: 0.44
Sulfur, wt %: 0.54
W&N factor: 12.0
Vis., cSt @ 100° F.: 65.00
Vis., cSt @ 210° F.: 6.72
Viscosity index: 43.1
Refractive index @ 67° C.: 1.4837
Basic nitrogen, wt %: 0.0289
Bromine No.: 10.0
V/Fe/Ni, ppm: 0.05/0.05/0.70

Vacuum residuum
Range, °F.: 1,000 +
Gravity, °API: 8.1
Yield, vol %: 21.74
Carbon residue, Rams., wt %: 19.26
Sulfur, wt %: 1.10
V/Fe/Ni, ppm: 41.5/12.00/95.00

Fig. 1

Cano Limon crude oil distillation



Two high-quality onshore crude oils, Sharjah

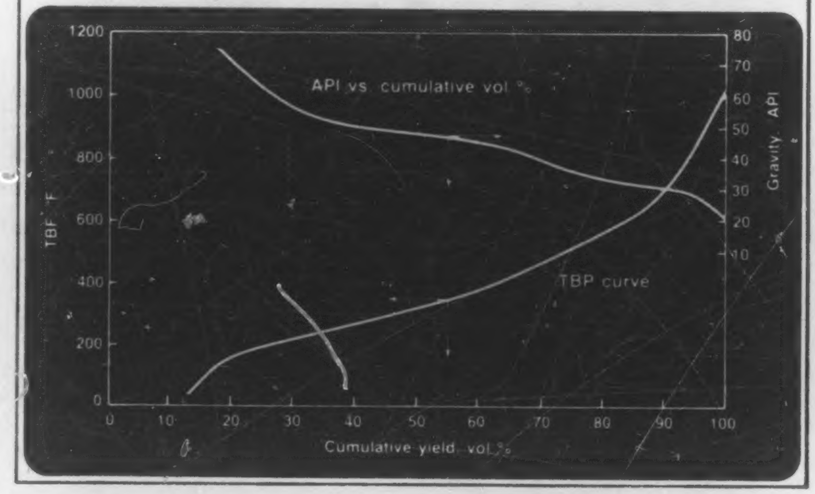
Richard A. Corbett
Refining Editor

Two northern U.A.E. condensates are actually considered high-quality crude oils. Both have respectable yields in the gas-oil range. Sharjah Condensate is produced from the Saaja gas/condensate field in Sharjah, U.A.E. Initial production, which began in mid-1982, is now 60,000 b/d.

The condensate is transported to the Hamriyah terminal through a 20-mile, 12-in. pipeline. From the terminal, the condensate travels through a 30-in. pipeline to a single point mooring (SPM) buoy in the Persion Gulf. The SPM can handle 250,000 dwt tankers.

Margham Light is produced in Dubai. Production from the Margham gas/condensate field, discovered in 1982, is presently 25,000 b/d. The condensate moves by pipeline to the new Port of Jebal Ali outside Dubai which can handle very large crude tankers. Information regarding these assays, and previous assays in the series, is in OGJ, Apr. 11, 1983.

Sharjah condensate



Sharjah Condensate, Sharjah, U.A.E.

Hamriyah terminal to SPM in Persian Gulf

Crude
Gravity, °API: 49.7
Sp gr, 60° F.: 0.7809
Sulfur, wt %: 0.10
Rvp, psi: 10.2
Pour pt., °F.: −25
Nuet no., mg KOH/g: 0.01
Rams. car., wt %: 0.1
Kin. vis., cst @ 68° F.: 1.44
@ 100° F.: 0.96
V/Ni/Fe,ppm:0/0/0

Gasoline
Range, °F.: C_5 - 200
Yield, vol %: 21.9
Gravity, °API: 72.8
Sulfur, wt %: 0.024
Rvp, psi: 10.7
Charac. factor 12.16
P/N/A, vol %: 78.4/14.4/7.2
RONC: 73.7
MONC: 72.3

Naphtha
Range, °F.: 200-320
Yield, vol %: 22.3
Gravity, °API: 50.9
Sulfur, wt %: 0.008
Rvp, psi: 1.2
Charac. factor: 11.51
P/N/A, vol %: 55.9/21.5/22.6
RONC: 61.6
MONC: 60.0

Heavy naphtha
Range, °F.: 320-400
Yield, vol %: 11.6
Gravity, °API: 46.8
Sulfur, wt %: 0.006
Charac. factor: 11.76
Aromatics, vol %: 27.2
Aniline pt., °F.: 124.9
Diesel index: 58.4
Cetane index: 36.9
Freeze pt., °F.: −74
Smoke pt., mm: 22

Kerosine
Range, °F.: 320-520
Yield, vol %: 25.8
Gravity, °API: 42.2
Sulfur, wt %: 0.032
Rvp, psi: 11.69
Aromatics, vol %: 33.4
Aniline pt., °F.: 137.5
Diesel index: 58.0
Cetane index: 40.3
Freeze pt., °F.: −53
Cloud pt., °F.: −64
Pour pt., °F.: −67
Smoke pt., mm: 20
Nuet. no., mg KOH/g: 0.03
Vis., SUS @ 68° F.: 31.8

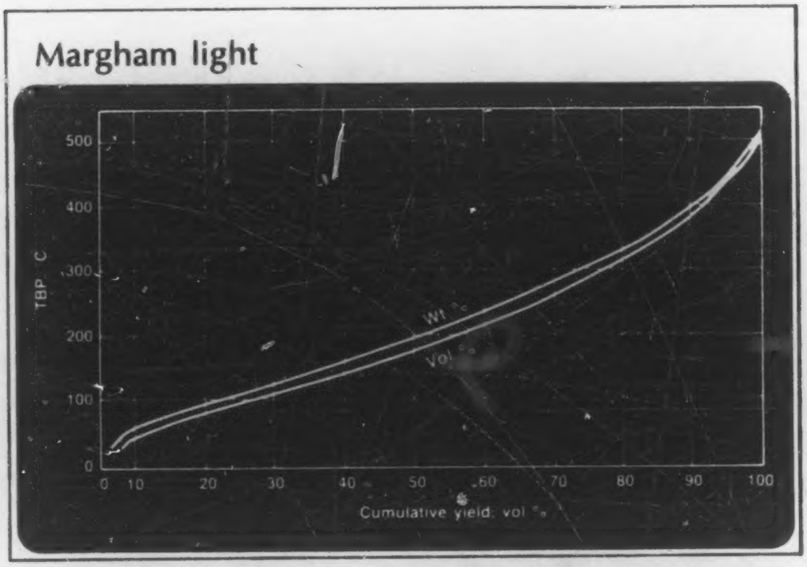
Diesel
Range, °F.: 520-650
Yield, vol %: 10.9
Gravity, °API: 33.8
Sulfur, wt %: 0.266
Charac. factor: 11.75
Aniline pt., °F.: 166.4
Diesel index: 56.2
Cetane index: 49.5
Cloud pt., °F.: 24
Pour pt., °F.: 21
Nitrogen, wt %: 0.006
Nuet. no., mg KOH/g: 0.05
Vis., SUS @ 68° F.: 44.8
@ 122° F.: 36.3

Gas oil
Range, °F.: 650-850
Yield, vol %: 9.1
Gravity, °API: 29.7
Sulfur, wt %: 0.392
Charac. factor: 11.95
Pour pt., °F.: 80
Nitrogen, wt %: 0.030
Nuet. no., mg KOH/g: 0.09
Rams. Car., wt %: 0.01
Vis., SUS @ 122° F.: 58.9
@ 210° F.: 38.0

Residuum
Range, °F.: 650+
Yield, vol %: 13.3
Gravity, °API: 27.8
Sulfur, wt %: 0.413
Pour pt., °F.: 89
Nitrogen, wt %: 0.046
Rams. car., wt %: 0.52
Vis., SUS @ 122° F.: 75.2
@ 210° F.: 42.8
V/Fe ppm: 1/1

Residuum
Range, °F.: 850+
Yield, vol %: 4.2
Gravity, °API: 23.8
Sulfur, wt %: 0.457
Pour pt., °F.: 122

Condensate and Margham Light, are assayed


Margham light

Nitrogen, wt %: 0.079
Rams. car., wt %: 1.57
Vis., SUS @ 122° F.: 281
@ 210° F.: 70.9
V/Fe, ppm: 2/2

Margham Light, Dubai, U.A.E.

Port of Jebal Ali

Crude
Gravity, °API: 50.33
Vis. cSt @ 20° C.: 1.49
Pour pt., °C.: −8
Rvp psi: 9.8
Salt, mg/l: 4
Water, wt %: 0.008
Water, vol %: < 0.01
H_2S, ppm: <5
Neut. no., mg KOH/g: <0.01
Sediment, wt %: <0.01
Sulfur, wt %: 0.04
Wax content, wt %: 4.04
Con. carbon, wt %: 0.03
Ash, wt %: <0.01
Asphaltenes, wt %: 0.05
Calorific value, BTU/lb: 20207
V/Ni/Na, ppm: <0.1/<0.1/0.4

Light naptha
Range, °C.: IBP-75
Yield, vol %: 12.88
Gravity, °API: 81.30
Sulfur, wt %: 0.02
Mercaptan sulfur, ppm: <5
Paraffins, wt %: 81.6
Naphthenes, wt %: 10.9
Aromatics, wt %: 7.5
Olefins, vol.%: 0.6

Naphtha
Range, °C.: 75-165
Yield, vol %: 29.64
Gravity, °API: 53.15
Sulfur, wt %: 0.01
Mercaptan sulfur, ppm: <5
Paraffins, wt %: 45.1
Naphthenes, wt %: 25.0
Aromatics, wt %: 29.9
Olefins, vol %: 1.0

Kerosine
Range, °C.: 165-235
Yield, vol %: 16.89
Gravity, °API: 44.52
Sulfur, wt %: 0.02
Smoke pt., mm: 22
Freeze pt °C.: −53
Aromatics, vol %: 20.4
Flash pt °C.: 61
Copper strip corrosion: 1a
Existent gum, mg/100 ml: 1
Neut. no., mg KOH/g: <0.01

Diesel
Range, °C.: 235-300
Yield, vol %: 13.34
Gravity, °API: 37.22
Sulfur, wt %: 0.02
Cetane index: 51
Pour pt. °C.: −26
Cloud pt. °C.: −23
Cold filter plug pt. °C.: −25
Kin. cSt @ 37.8° C.: 2.79
Kin. cSt @ 50° C.: 2.22
Neut. no., mg KOH/g: <0.01
Con. carbon, 10% bott., wt %: 0.04
Flash pt., °C.: 113
Copper strip corrosion: 1a
Aniline pt. °C.: 70.6
Nitrogen, wt %: <0.01

Diesel
Range, °C.: 300-350
Yield, vol %: 7.25
Gravity, °API: 36.66
Sulfur, wt %: 0.27
Cetane index: 58
Pour pt. °C.: 1
Cloud pt. °C.: 3
Cold filter plug pt. °C.: 1
Kin. cSt @ 37.8° C.: 6.00
Kin. cSt @ 50° C.: 4.40
Neut. no., mg KOH/g: <0.01
Con. carbon, 10% bott., wt %: 0.73
Flash pt., °C.: 159
Copper strip corrosion: 1a
Nitrogen, wt %: <0.01

Gas oil*
Range, °C.: 350-370
Yield, vol %: 2.63
Gravity, °API: 34.18
Sulfur, wt %: 0.25
Cloud pt., °C.: 26
*Insufficient sample for complete analysis of this fraction.

Heavy gas oil
Range, °C.: 350-514.3
Yield, vol %: 13.78
Gravity, °API: 32.04
Sulfur,wt %: 0.18
Kin. cSt @ 37.8° C.: 22.5
@ 50° C.: 14.6
@ 82.2° C.: 6.05
@ 100° C.: 4.26
Pour pt., °C.: 36
Asphaltenes, wt %: <0.05
Con. carbon, wt %: <0.01
V/Ni, mg/kg: <0.1/0.2
Neut. no., mg KOH/g: 0.05
UOP K: 12.40
Nitrogen, wt %: <0.01
Aniline pt., °C.: 103.1
Wax, wt %: 17.2
Ash, wt %: <0.01
Sediment, wt %: <0.01

Residue
Range, °C.: 350+
Yield, vol %: 13.98
Gravity, °API: 31.73
Sulfur, wt %: 0.17
Kin. cSt @ 37.8° C.: 25.2
@ 50° C.: 14.9
@ 82.2° C.: 6.51
@ 100° C.: 4.58
Pour pt., °C.: 32
Asphaltenes, wt %: <0.05
Con. carbon, wt %: 0.04
V/Ni, mg/kg: <0.1/0.9
Neut. no., mg KOH/g: 0.15
Nitrogen, wt %: 0.02
Aniline pt., °C.: 102.4
Wax, wt %: 20.3
Ash, wt %: 0.01
Sediment, wt %: <0.01

Australian regulatory changes open crudes to export

Richard A. Corbett
Refining/Petrochemical Editor

Since the price collapse of 1986, the Australian Government has been deregulating its domestic crude oils, which since the late 1960s, have been allocated solely to Australian refiners at set prices, and where no crude oil was exported.

This arrangement is now being dismantled, and has allowed export since 1983, with modest free-market sales since 1985.

Much of the exported crude is currently from older, established fields, but with a number of new fields that have come into production recently, some of the newer streams are beginning to find their way to many distant parts of the refining world.

There are five important Australian crude oils either now being, or likely to be, exported: Barrow Island and Gippsland crudes, which are produced from fields discovered in the 1960s; and Jabiru, Jackson blend, and Northwest Shelf condensate, all coming to production during the last 5 years.

Gippsland. Gippsland crude oil, also known as Bass Strait, is produced from the Gippsland basin, offshore Victoria in the eastern Bass Strait. The operator, Esso Exploration Australia, has a 50% interest in the basin, with the other 50% owned by BHP Petroleum Pty. Ltd. Production rates for crude and condensate from the basin were estimated at about 455,000 b/d in late 1986.

Gippsland crude is a light, sweet premium crude capable of producing very high yields of transport fuels with minimal refinery treatment (see assay) because atmospheric distillates to about 75 vol % of crude are obtainable. The intermediate, paraffinic-base crude contains moderate wax, but has a low viscosity.

The light straight run naphtha contains a high proportion of isoparaffins, making it a good gasoline base blendstock. The medium and heavy naphthas are good isomerization and reforming feeds because of high naphthenes and aromatics content. Sulfur content of the gas oils is less than 0.25 wt %, making it suitable for low-sulfur fuel oil, but better suited for catalytic cracking because of its low metals content.

Loading jetties for the crude are located at Long Island Point and Crib Point in Westernpoint Bay, about 100 km south of Melbourne in Victoria.

Each jetty can handle tankers up to 100,000 dwt, with pumping rates of 55,000 bbl/hr at Long Island, and 45,000 bbl/hr at Crib Point.

Barrow Island. The Barrow Island oil field, found in 1964, was the first oil discovery in Australia. The crude is named for the island on which it is produced, located off the northwest coast of Western Australia.

The field is operated by West Australian Petroleum Pty. Ltd. (Wapet). Wapet is a consortium of subsidiaries of Chevron Corp., Texaco Inc., and Royal Dutch Shell, each with a two-sevenths interest, and Ampol Exploration of Australia with a one-seventh interest.

Barrow Island crude is a sweet, moderately light crude with good yields of naphthas and middle distillates. Light gas oil and heavier cuts are low in sulfur and metals contents, making them suitable for low-sulfur fuel oil and catalytic cracking.

Barrow Island crude is loaded from a single buoy mooring (SBM) off Barrow Island and shipped to refining centers in Australia. Despite the fact that production has been declining from this mature field to about 15,000 b/d presently, with the changes in Australian regulations, some of the crude may still find its way to refineries around the world.

Jabiru. The Jabiru oil field, named after a rare tropical northern Australian stork, is located in the Timor Sea frontier about 300 km off the Kimberly coast of Australia's Northern Territory, and about 680 km west of Darwin. Discovered in 1983, present production is about 13,500 b/d, but that is expected to be increased in the near future.

BHP Petroleum Pty. Ltd. is the operator of the field, holding a 50% interest, with the other participants: Ampol Exploration, 6.25%; Brenda Mines, 1.1%; Esso Exploration and Production, Australia, 18.75%; Norpac Securities, 1.1%; Norcen International 12.5%; and Peko Oil, 10.3%. BHP is also developing the nearby Chalis field.

Jabiru crude is somewhat less waxy than Gippsland crude, but has similar properties. It is an intermediate/paraffinic base classed crude with low sulfur and metals contents. Substantial yields of middle distillate make it a good crude for refiners that emphasize product slates in the middle distillate range. The low sulfur and metals contents of the resid make it suitable for direct feeding to catalytic crackers.

Crude is loaded through a floating production system (FPS) that contains processing equipment to stabilize the crude oil in Jabiru field (see Fig. I and cover photo). The FPS is the converted 140,000-dwt tanker Jabiru Venture. Total storage capacity is about 1 million bbl (OGJ, Sept. 7, 1987, pp. 53-58).

The loading system can handle vessels in the range of 25,000-150,000 dwt, and is able to deliver parcel sizes up to 770,000 bbl at flow rates to 20,000 bbl/hr.

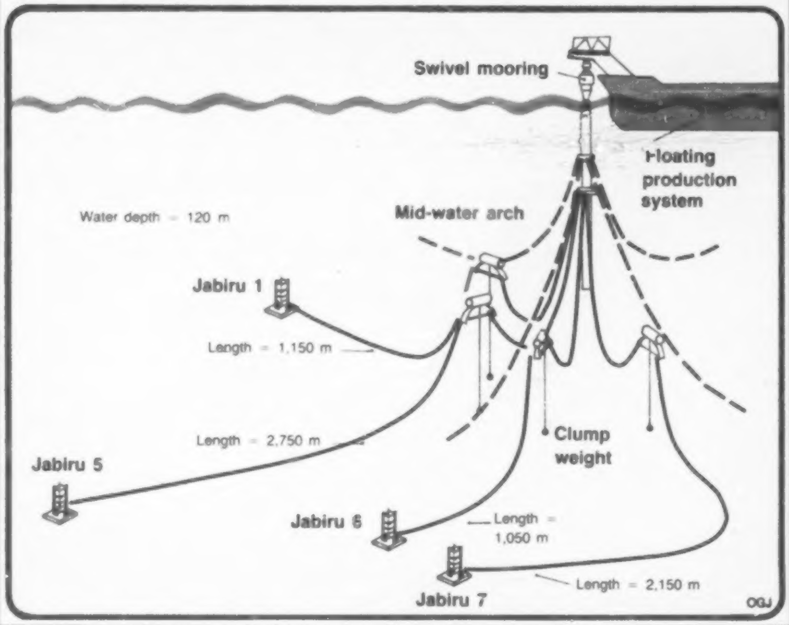
Northwest Shelf condensate. The Northwest Shelf project, encompassing three major gas fields off the Pilbara coast of Western Australia and a world scale LNG plant now under construction, produces the high-quality Northwest Shelf condensate. The project, about 1,200 km north of Perth, produced about 8,000 b/d of condensate in 1986, and was expected to double that amount in early 1987.

Woodside Petroleum is the operator in a joint venture with BP Development Australia, California Asiatic Oil Co., Shell Development Australia, and BHP Petroleum Pty. Ltd.

The high API gravity condensate provides good yields (65-66 vol %) of naphthas and about 30 vol % middle distillates. The naphthas are suitable for reforming into gasoline blendstock or aromatic petrochemical feedstocks. Total sulfur content is very low at 70 ppm.

Fig. 1

BHP's Jabiru production system



The first assay, conducted in November 1986, was completed on a sample with an Rvp of 6 psi. In January 1987, gas processing plant changes produced a condensate with an Rvp of 10 psi. Properties for the whole condensate are given for both the 6 and 10 psi Rvp streams (values in parentheses are for those properties that changed for the 10 psi Rvp stream; see assay). There were no significant differences observed in the density and other relevant properties in any fraction of the 10 psi Rvp condensate compared to the 6 psi Rvp condensate; therefore, 10 psi Rvp data are not included in the assay data for the fractions.

Northwest Shelf condensate is loaded from a dolphin berth in Withnell Bay. The berth can accomodate vessels from 19,500-130,000 dwt at loading rates to 18,000 bbl/hr.

Jackson blend. Jackson blend crude is supplied from the Cooper basin in southwestern Queensland. It is a blend of about 12 crudes from several oil fields producing in the area. Two of the participants in the field are Santos Ltd. and BHP Petroleum Pty. Ltd.

The crude is shipped via a 12-in., 495-mile pipeline completed in 1985, to Moonie in Queensland where it connects to an earlier-constructed pipeline to Brisbane. Initial flow was slated at 16,000 b/d, but the design of the line will allow up to 55,000 b/d. The line connects to the Ampol refinery at Lytton, near Brisbane.

Crude is loaded across the refinery for export. Although none of the crude is being exported at present, it is highly possible that it will in the near future.

Crude oil assays with more information on the Australian crudes follow.

Key to the assays...

Each assay is headed, in the following order, by the official name of the crude, the former or secondary name in parenthesis, and location and type loading facilities. Loading systems that frequently crop up are abbreviated. Those used are CBM (conventional buoy mooring), SPM (single point mooring), SBM (single buoy mooring), CALM (catenary anchor leg mooring), and SALM (single anchor leg mooring).

Gippsland (Bass Strait)

Jetties at Long Island Point and Crib Point

Crude

Gravity, °API: 45.4
Density @ 15% C.: 0.7993
Total sulfur, wt %: 0.10
Salt, lb/1,000 bbl: 0.5

Rvp, psi: 5.1
Total N, wt %: 0.15
Pour pt, °C.: 15
Wax, wt %: 8.9
Vis. @ 21.1° C., cSt: 2.93
Vis. @ 37.8° C., cSt: 2.03
Acid no., mg KOH/g: 0.11

Naphtha
Range, °C.: 20-190
Yield, vol %: 39.3
Gravity, °API: 61.6
Density @ 15° C., kg/l.: 0.7327
Sulfur, wt %: 0.03
P/N/A, vol %: 59.1/32.5/8.4

Kerosine
Range, °C.: 190-230
Yield, vol %: 7.1
Gravity, °API: 44.9
Density @ 15° C., kg/l.: 0.8432
Sulfur, wt %: 0.06
Aromatics, vol %: 14.7
Pour pt, °C.: −43
Smoke pt, mm: 22
Aniline pt, °C. 62.5
Cetane index: 44.7
Vis. @ 100° C., cSt: 1.44

Gas oil
Range, °C.: 230-340
Yield, vol %: 23.1
Gravity, °API: 36.2
Density @ 15° C., kg/l.: 0.8432
Sulfur, wt %: 0.08
Pour pt, °C.: −6
Cloud pt, °C.: −4
Cetane index: 51.7

Heavy gas oil
Range, °C.: 340-565
Yield, vol %: 27.4
Gravity, °API: 31.5
Density @ 15° C., kg/l.: 0.8678
Sulfur, wt %: 0.16
Wax, wt %: 35.6
Pour pt, °C.: 51
Aniline pt, °C.: 100.7
Rams. carbon, wt %. 0.3
Ni/V, ppm: 0.1/0.2
Vis. @ 100° C., cSt: 4.06

Residue
Range, °C.: 370+, 690+
Yield, vol %: 23.6
Gravity, °API: 30.4
Density @ 15° C., kg/l.: 0.8733
Sulfur, wt %: 0.22
Pour pt, °C.: 45
Ni/V, ppm: 0.3/0.6
Asphaltenes, wt %: 0.42

Barrow Island

SBM off Barrow Island

Crude
Gravity, °API: 36.8
Sulfur, wt %: 0.05
Kin. vis. @ 10° C., cSt: 3.40
Kin. vis. @ 100° C., cSt: 1.80
Pour pt, °C.: −30
Total acid no., mg KOH/g: 0.21

Gasoline
Range, °C.: C_5-65
Yield, vol %: 3.4
Density @ 15° C., kg/l.: 0.646
Sulfur, ppm: <50
RON clear: 78
P/N/A, vol %: 91/9/0

Light straight run
Range, °C.: 65-100
Yield, vol %: 7.7
Density @ 15° C., kg/l.: 0.728
Sulfur, ppm: <50
Ron clear: 70
P/N/A, vol %: 40/58/2

Naphtha
Range, °C.: 100-150
Yield, vol %: 14.4
Density @ 15° C., kg/l.: 0.759
Sulfur, ppm: <50
P/N/A, vol %: 46/47/7

Heavy naphtha
Range, °C.: 150-200
Yield, vol %: 15.5
Density @ 15° C., kg/l.: 0.803
Sulfur, wt %: 0.01
Aromatics, vol %: 12
Smoke pt, mm: 27
Freeze pt, °C.: <−60

Kerosine
Range, °C.: 200-250
Yield, vol %: 16.9
Density @ 15° C., kg/l.: 0.853
Kin. vis., @ 40° C., cSt: 1.67
Sulfur, wt %: 0.015
Cloud pt, °C.: −30
Aromatics, vol %: <20
Smoke pt, mm: 19
Freeze pt, °C.: <−60

Diesel
Range, °C.: 250-300
Yield, vol %: 14.6
Density @ 15° C., kg/l.: 0.886
Kin. vis. @48° C., cSt: 3.4
Sulfur, wt %: 0.02
Pour pt, °C.: <−30
Cloud pt, °C.: <−30
Cetane index: 36.5

Gas oil
Range, °C.: 300-350
Yield, vol %: 9.7
Density @ 15° C., kg/l.: 0.906
Kin. vis. @ 40° C., cSt: 8.11
Sulfur, wt %: 0.05
Pour pt, °C.: −30
Cloud Pt, °C.: −26
Cetane index: 41

Heavy gas oil
Range, °C.: 350-370
Yield, vol %: 2.7
Density @ 15° C., kg/l.: 0.922
Density @ 70° C., kg/l.: 0.884
Kin. vis. @ 40° C., cSt: 18.2
Sulfur, wt %: 0.09
Pour pt., °C.: −9
Cloud pt., °C.: −8

Residue
Range, °C.: 370+
Yield, vol %: 14.5
Density @ 15° C., kg/l.: 0.953
Density @ 70° C., kg/l.: 0.917
Kin. vis. @ 60° C., cSt: 63.9
Kin. vis. @ 100° C., cSt: 15.6
Sulfur, wt %: 0.16
Wax content, wt %: 3.5
Pour pt, °C.: 12
Acid no., mg KOH/g: 0.16
Asphaltenes, wt %: 0.2
Con. carbon, wt %: 3.2
V/Ni, ppm: 1/6

Jabiru

Floating production system in offshore producing area

Crude
Gravity, °API: 42.3
Total sulfur, wt %: 0.04
Salt, ppm: 38.6
Total N, wt %: 0.05
Rvp, psi: 4.5
UOP K: 11.9
Total acid no., mg KOH/g: 0.02
Asphaltenes, wt %: <0.05
Ni/V/Na, ppm: 3/0.1/11

Light naphtha
Range, °C.: 20-70
Yield, vol %: 3.9
Gravity, °API: 84.5
Density @ 15° C., kg/l.: 0.6551
Sulfur, wt %: 0.01
P/N/A, vol %: 87.7/11.9/0.4

Heavy naphtha
Range, °C.: 70-190
Yield, vol %: 23.0
Gravity, °API: 54.8
Density @ 15° C., kg/l.: 0.7593
Sulfur, wt %: 0.01
P/N/A, vol %: 49/38.2/12.8

Kerosine
Range, °C.: 150-230
Yield, vol %: 16.8
Gravity, °API: 47.3
Density @ 1° C., kg/l.: 0.7911
Sulfur, wt %: <0.01
Aromatics, vol %: 16.3

Freeze pt, °C.: −54
Smoke pt, mm: 25
Aniline pt, °C.: 58.4
Vis. @ 40° C., cSt: 1.13

Kerosine
Range, °C.: 190-230
Yield, vol %: 9.2
Gravity, °API: 44.5
Density @ 15° C., kg/l.: 0.8036
Sulfur, wt %: <0.001
Aromatics, vol %: 14.8
Freeze pt, °C.: −43
Smoke pt, mm: 25
Aniline pt, °C.: 63.0
Vis. @ 40° C., cSt: 1.36

Gas oil
Range, °C.: 230-360
Yield, vol %: 37.9
Gravity, °API: 37.5
Density, @ 15° C., kg/l.: 0.8370
Sulfur, wt %: 0.02
Wax, wt %: 0.2
Pour pt, °C.: −3
Cloud pt, °C.: −2
Aniline pt, °C.: 75.0
Cetane index: 54.0
Vis. @ 100° C., cSt: 3.29

Heavy gas oil
Range, °C.: 360-540
Yield, vol %: 22.5
Gravity, °API: 30.8
Density @ 15° C., kg/l.: 0.8713
Sulfur, wt %: 0.10
Wax, wt %: 28.3
Pour pt., °C.: 39
Aniline pt, °C.: 97.8
Rams. carbon, wt %: 0.12
Ni/V ppm: 1.0/0.1
Asphaltenes, wt %: 0.08
Vis. @ 100° C., cSt: 4.05

Residue
Range, °C.: 360+
Yield, vol %: 24.1
Gravity, °API: 29.4
Density @ 15° C., kg/l.: 0.8791
Sulfur, wt %: 0.12
Wax, wt %: 28.1
Pour pt, °C.: 39
Rams. carbon, wt %: 0.24
Ni/V, ppm: 2.2/0.2
Asphaltenes, wt %: 0.08
Vis. @ 100° C., cSt: 4.77

Residue
Range, °C.: 540+
Yield, vol %: 1.6
Gravity, °API: 10.5
Density @ 15° C., kg/l.: 0.9962
Sulfur, wt %: 0.32
Pour pt, °C: 51
Rams. carbon, wt %: 12.5
Ni/V, ppm: 29/2.7
Asphaltenes, wt %: 1.9
Vis. @ 100° C., cSt: 239.5

Northwest Shelf condensate

Dolphin berth in Withnell Bay

Whole condensate, 6 Rvp (10 Rvp)
Gravity, °API: 53.1 (55.8)
Density, @ 15° C., kg/l.: 0.7661 (0.7551)
Total sulfur, ppm: 102
Salt, mg/l.: 12.8
Rvp, psi: 6.1 (10.5)
Total N, wt %: 0.005
Pour pt, °C.: −36
Wax, wt %: <0.1
Vis. @ 20° C., cSt: 0.99 (0.90)
Vis. @ 40° C., cSt: 0.80 (0.73)
RON clear: 54.0 (58.6)
UOP K: 11.8 (11.6)
Total acid no., mg KoH/g: 0.02
Aromatics, vol %: 10.7 (10.8)
Ni/V, ppm: 0.2/<0.1
Na/Cu/Fe, ppm: 0.5/1.0/1.1

Gasoline
Range, °C.: C_5−70
Yield, vol %: 17.1
Gravity, °API: 85.9
Density @ 15° C., kg/l.: 0.6508
Sulfur, wt %: 0.004
n-paraffins, vol %: 46.0
i-paraffins, vol %: 43.2
Naphthenes, vol %: 9.5
Aromatics, vol %: 1.3

Naphtha
Range, °C.: 70-190
Yield, vol %: 50.3
Gravity, °API: 53.9
Density @ 15° C., kg/l.: 0.7630
Sulfur, wt %: 0.004
n-paraffins, vol %: 21.2
i-paraffins, vol %: 20.4
Aromatics, vol %: 16.8

Kerosine
Range, °C.: 150-230
Yield, vol %: 18.2
Gravity, °API: 44.2
Density @ 15° C., kg/l.: 0.8049
Sulfur, wt %: 0.02
Aromatics, vol %: 22.3
Freeze pt, °C.: −60
Smoke pt, mm: 21
Aniline pt, °C.: 48.6
Vis. @ 40° C., cSt: 1.06

Gas oil
Range, °C: 190-230
Yield, vol %: 8.4
Gravity, °API: 42.0
Density @ 15° C., kg/l.: 0.8152
Sulfur, wt %: 0.01
Aromatics, vol %: 19.7
Freeze pt, °C.: −47
Smoke pt, mm: 21
Aniline pt, °C.: 54.8
Vis. @ 40° C., cSt: 1.06

Heavy gas oil
Range, °C.: 230-360
Yield, vol %: 18.7
Gravity, °API: 33.5
Density @ 15° C., kg/l.: 0.8570
Sulfur, wt %: 0.03
Wax, wt %: <0.1
Pour pt, °C.: −12
Cloud pt, °C.: −13
Aniline pt, °C.: 63.8
Cetane index: 45.1
Vix. @ 40° C., cSt: 3.02
Vis. @ 100° C., cSt: 1.24

Residue
Range, °C.: 360+, 680+
Yield, vol %: 2.7
Gravity, °API: 29.3
Density @ 15° C., kg/l.: 0.8794
Sulfur, wt %: 33.0
Pour pt, °C.: 30
Rams. carbon, wt %: 0.31
Ni/V, ppm: 0.6/<0.1
Asphaltenes, wt %: 0.26
Vis. @ 100° C., cSt: 3.63

Jackson blend

Loaded across Ampol refinery at Lytton

Crude
Gravity, °API: 41.9
Density @ 15° C., kg/l.: 0.8155
Sulfur, wt %: 0.03

Light straight run
Range, °C.: C_5-190
Yield, vol %: 16.5
RON clear: 25.9

Gas oil
Range, °C.: 190-230
Yield, vol %: 4.5
Aromatics, vol %: 7.0
Sulfur, wt %: 0.01

Heavy gas oil
Range, °C.: 230-320
Yield, vol %: 20.1
Sulfur, wt %: 0.02
Cloud pt, °C.: −1
Cetane index: 59.6

Residue
Range, °C.: 320+
Yield, vol %: 58.5
Con. carbon, wt %: 0.9
Ni/V, ppm: 0.4/0.1
Rams. carbn, wt %: 0.7

AILLEEN CANTRELL
Director of Editorial Surveys
The Oil & Gas Journal

1988 Worldwide Petrochemical Survey

ABU DHABI

RUWAIS FERTILIZER INDUSTRIES

Ruwais. Feed: associated gas. Products: ammonia (1,000 mt/d), urea (1,500 mt/d).

ALGERIA

SONATRACH

Arzew. Feed: natural gas. Products: ammonia (1,000 mt/d), aromatics mix (1,152 mt/d), benzene (273 mt/d), ethylene (364 mt/d), formaldehyde (61 mt/d), methanol (303 mt/d), orthoxylene (115 mt/d), ld polyethylene (145 mt/d), polyvinyl chloride (106 mt/d), toluene (5,000 mt/d), urea (400 mt/d), xylene mix (748 mt/d).

ARGENTINA

ATANOR

Baradero, Buenos Aires. Feed: ethyl alcohol. Products: acetaldehyde (5,345 mt/y), acetic acid (7,060 mt/y), acetic anhydride (2,140 mt/y), acetates (12,600 mt/y).

Munro, Buenos Aires. Feed: acetates, ethyl alcohol, methanol. Products: acetaldehyde (2,405 mt/y), acetic acid (3,210 mt/y), acetone (1,400 mt/y), ethanol (11,200 mt/y), formaldehyde (25,680 mt/y).

Río Tercero, Córdoba. Feed: ethyl alcohol, natural gas. Products: acetaldehyde (3,250 mt/y), acetic acid (4,280 mt/y), methanol (12,880 mt/y).

CARBOCLOR INDUSTRIAS QUIMICAS

Campana. Feed: C_3 and C_4 refinery cuts. Products: acetone (12,000 mt/y), isopropanol (40,000 mt/y).

CASCO SAIC

Pilar. Feed: methanol, natural gas. Products: formaldehyde (38,000 mt/y), methanol (20,000 mt/y).

DIRECCION GENERAL DE FABRICACIONES MILITARES

Campana. Feed: hydrocarbon fractions. Products: aromatics mix, normal paraffins, toluene, xylene mix, solvents.

Rio Tercero, Cordoba. Feed: natural gas. Product: ammonia (12,000 mt/y).

DUPERIAL SAIC

(subsidiary of Imperial Chemical Industries)

San Lorenzo. Feed: sulfur, natural gas, naphtha, orthoxylene, ethylene, phthalic anhydride, alcohols. Products: carbon bisulfide (14,000 mt/y), ethylene (15,000 mt/y), phthalic anhydride (12,400 mt/y), ld polyethylene (20,000 mt/y), plasticizers (18,000 mt/y), propylene-butadiene (6,000 mt/y).

ELECTROCLOR SAIC

Capitán Bermúdez, Santa Fe. Feed: calcium carbide, chlorine, hydrogen. Products: acetylene (15,000 mt/y), ammonia (3,000 mt/y), polyvinyl chloride (32,000 mt/y).

IPAKO-Industrias Petroquimicas Argentinas

(owned by private Argentine interests).

Ensenada. Feed: refinery gases. Products: ethylene (15,000 mt/y), ld polyethylene (14,000 mt/y).

MALEIC SA

Ensenada, Buenos Aires. Feed: n-butane. Product: maleic anhydride (7,200 mt/y).

MONSANTO ARGENTINA SAIC

Zarate. Feed: styrene. Products: ABS (9,000 mt/y), polystyrene (40,000 mt/y).

PASA PETROQUIMICA ARGENTINA

(owned by Amcorp SA, Anglo American Corp., Argentina Holdings Ltd., Uniroyal Chemical CI, Vista Chemical Co.)

Pto. Gral. San Martin, Santa Fe. Feed: butane, naphtha, propane. Products: aromatics (180,000 mt/y), butadiene (37,000 mt/y), ethylbenzene (66,000 mt/y), ethylene (24,000 mt/y), styrene (70,000 mt/y), SBR (53,000 mt/y).

PETROQUIMICA BAHÍA BLANCA SAIC

Bahia Blanca. Feed: ethane. Products: ethylene (201,000 mt/y).

PETROQUIMICA GENERAL MOSCONI

Ensenada, Buenos Aires. Feed: naphtha. Products: aromatics mix (250,000 mt/y), benzene (120,000 mt/y), cyclohexane (80,000 mt/y), orthoxylene (25,000 mt/y), paraxylene (40,000 mt/y), toluene (120,000 mt/y), xylene mix (10,000 mt/y).

PETROSUR SAIC

Campana. Feed: natural gas. Products: ammonia (230 mt/d), urea (360 mt/d).

POLISUR

Bahia Blanca. Feed: ethylene. Product: ld polyethylene (190,000 mt/y).

SUDAMTEX SA

Azul, Buenos Aires. Feed: dimethyl terephthalate, ethylene glycol. Products: methanol (1,650 mt/y), polyester (6,500 mt/y).

AUSTRALIA

AFL HOLDINGS LTD.

Gibson Island, Queensland. Feed: natural gas. Products: ammonia (237,000 mt/y), urea (245,000 mt/y).

Newcastle, NSW. Feed: natural gas. Product: ammonia (238,000 mt/y).

ALTONA PETROCHEMICAL CL

(50% Esso Australia Ltd., 50% Mobil Oil Australia).

Altona, Vic. Feed: gas oil, ethane. Products: butadiene (17,000 mt/y), ethylene (170,000 mt/y), propylene (50,000 mt/y).

AMPOL REFINERIES LTD.

Lytton, Brisbane. Feed. karosine, naphtha, reformate. Products: toluene (2,000 mt/y), solvents (5,500 mt/y).

AUSTRALIAN CARBON BLACK PL

(100% Cabot Corp.)

Altona, Vic. Feed: petroleum residual. Product: carbon black (58,000 mt/y).

AUSTRALIAN SYNTHETIC RUBBER CL

(35% Esso Australia Ltd., 35% Mobil Oil Australia Ltd., 30% Goodyear Tire & Rubber CL).

Altona. Feed: butadiene, styrene. Products: polybutadiene (10,000 mt/y), SBR (35,000 mt/y).

BORDEN AUSTRALIA PL

Brisbane, Gibson Island. Feed: methanol. Products: formaldehyde (23,000 mt/y).

Melbourne. Feed: methanol. Products: formaldehyde (23,000 mt/y).

COMPOL LTD.

(50% Mobil, 50% Exxon).

Altona, Vic. Feed: ethylene. Products: polyethylene (102,000 mt/y).

CONTINENTAL CARBON AUSTRALIA PL

(49% affiliate of Witco Corp.—Concarb Div.)

Kurnell, NSW. Feed: creosote oil, FCC bottoms, ethylene tars. Product: carbon black (25,000 mt/y).

HOECHST AUSTRALIA LTD.

(owned 95% by Hoechst AG).

Altona. Feed: olefins. Products: hd polyethylene (75,000 mt/y), polypropylene (35,000 mt/y).

ICI AUSTRALIA LTD.

Botany, NSW. Feed: LPG, light naphtha. Products: butadiene (23,000 mt/y), butylenes (23,000 mt/y), ethylene (250,000 mt/y), ethylene oxide (30,000 mt/y), ld polyethylene (90,000 mt/y), polypropylene (55,000 mt/y), propylene (95,000 mt/y), polyvinyl chloride (56,000 mt/y), vinyl chloride (60,000 mt/y).

Laverton, Vic. Feed: vinyl chloride. Product: polyvinyl chloride (50,000 mt/y).

Rhodes. Feed: ethylene, heptene, natural gas, naphthalene, propylene. Products: acetaldehyde (15,000 mt/y), acetic acid (18,500 mt/y), acetic anhydride (3,000 mt/y), butanols (9,500 mt/y), isooctanol (14,000 mt/y), phthalic anhydride (21,500 mt/y), vinyl acetate (13,000 mt/y), solvents (9,500 mt/y), plasticizers (32,500 mt/y).

KWINANA NITROGEN CPL

Kwinana. Feed: natural gas, refinery offgases. Product: ammonia (80,000 mt/y).

MONSANTO AUSTRALIA LTD.

West Footscray. Feed: benzene, ethane, propylene. Products: acetone, ethylene, phenol, polyester, polystyrene, styrene, ABS, SBR.

SHELL CHEMICAL (AUSTRALIA) PL

Clyde, N.S.W. Feed: refinery gases. Products: polypropylene (34,000 mt/y).

Geelong, Victoria. Feed: naphtha, gasoline, refinery gases. Products: alkylbenzene-toluene-xylene mix-solvents (90,000 mt/y), polypropylene (75,000 mt/y).

AUSTRIA

CHEMIE LINZ AG

Enns. Feed: propylene. Product: acrylonitrile (75,000 mt/y).

Linz. Feed: benzene, orthoxylene. Products: maleic anhydride (19,000 mt/y), melamine (35,000 mt/y), phthalic anhydride (35,000 mt/y), urea (400,000 mt/y), plasticizers (36,000 mt/y).

HALVIC KUNSTOFFWERKE GmbH

Hallein. Feed: vinyl chloride monomer. Product: polyvinyl chloride.

ÖMV AG

Schwechat. Feed: butane, gasoil, naphtha. Products: butadiene (50,000 mt/y), ethylene (320,000 mt/y), propylene (160,000 mt/y).

PETROCHEMIE DANUBIA GmbH

(66$^{2}/_{3}$% OMV AG, 33$^{1}/_{3}$% CL Holding AG)

Schwechat. Feed: ethylene, propylene. Product: phthalic anhydride (35,000 mt/y), polyethylene (300,000 mt/y), polypropylene (200,000 mt/y).

VIANOVA KUNSTHARZ AG

Werndorf. Feed: alcohols, acids, oils. Products: acrylics and alkyds, unsaturated polyesters, water soluble resins (45,000 mt/y).

BAHRAIN

GULF PETROCHEMICAL INDUSTRIES CO.

Manama. Feed: methane. Products: ammonia (330,000 mt/y), methanol (330,000 mt/y).

BANGLADESH

ZIA FERTILIZER CL

(Bangladesh Chemical Industries Corp.)

Ashuganj. Feed: natural gas. Products: ammonia (930 mt/d), urea (1,600 mt/d).

BELGIUM

AMOCO CHEMICAL CO.

Geel. Feed: metaxylene, methanol, paraxylene, propylene. Products: dimethyl terephthalate (61,000 mt/y), isophthalic acid (39,000 mt/y), polypropylene (170,200 mt/y), terephthalic acid (90,000 mt/y).

BASF ANTWERPEN NV

Antwerp. Feed: ethylene, benzene, cyclohexane. Products: caprolactam (150,000 mt/y), ethylene glycol (160,000 mt/y), ethylene oxide (150,000 mt/y), polystyrene (145,000 mt/y), polyvinyl chloride (80,000 mt/y), vinyl chloride (160,000 mt/y).

BAYER ANTWERPEN NV

Antwerp and Kallo. Feed: cyclohexane. Products: caprolactam (110,000 mt/y), polyamid 6 (10,000 mt/y).

BP CHEMICALS BELGIUM

Antwerp. Products: glycols (130,000 mt/y), ethylene oxide (113,000 mt/y), ld polyethylene (135,000 mt/y), esters-ethers (75,000 mt/y).

DOW CHEMICAL

Tessenderlo. Products: polystyrene, hd polyethylene.

DSM

Limburgse Vinyl MNV

(joint venture with Entreprise Minière et Chimique)

Tessenderlo. Feed: ethylene, C12 HCl. Product: vinyl chloride (450,000 mt/y).

EXXON CHEMICAL BELGIUM

Antwerp. Feed: ethylene, hydrocarbons. Products: polyethylene (250,000 mt/y), solvents (550,000 mt/y).

Meerhout. Feed: ethylene. Product: polyethylene (250,000 mt/y).

HIMONT BELGIUM

Feluy. Feed: propylene. Product: polypropylene (260,000 mt/y).

KEMIRA SA.

Tertre. Feed: natural gas. Product: ammonia (360,000 mt/y).

MONTEFINA.

(50% Himont Inc., 50% Petrofina)

Feluy. Feed: propylene, styrene. Products: polypropylene (240,000 mt/y), polystyrene (70,000 mt/y), expandable polystyrene (30,000 mt/y).

NESTE POLYPROPYLENE NV

Beringen. Feed: propylene. Product: polypropylene (120,000 mt/y).

PHILLIPS 66 CO.

Tessenderlo. Feed: olefins. Product: petrosulfur compounds (13,000 mt/y).

POLYSAR BELGIUM NV

Antwerp. Feed: isobutylene. Products: butyl rubber (85,000 mt/y).

SOLVIC SA

Jemeppe-sur-Sambre. Feed: ethylene. Products: vinyl chloride, polyvinyl chloride.

UCB-FTAL

Ostend. Feed: alcohols, cyclohexanol, orthoxylene, phenol. Products: phthalic anhydride (80,000 mt/y), phthalates (65,000 mt/y).

BRAZIL

ALBA AMAZÓNIA SA

Manaus. Feed: methanol. Product: formaldehyde (30,000 mt/y).

ALBA NORDESTE SA

Abreu e Lima. Feed: methanol. Product: formaldehyde (8,000 mt/y).

ALBA QUÍMICA SA

Cotia, S.P. Feed: ethanol, methanol. Products: acetaldehyde (7,200 mt/y), formaldehyde (25,200 mt/y).

Cubatão. Feed: methanol, naphtha. Products: formaldehyde (45,400 mt/y), methanol (33,600 mt/y).

Curitiba, P.R. Feed: methanol. Products: formaldehyde (45,400 mt/y).

Serra. Feed: methanol. Product: formaldehyde (29,700 mt/y).

BANN QUÍMICA SA

Ermelino Matarazzo, SP. Feed: aniline. Product: rubber chemicals (12,800 mt/y).

Paulinia, SP. Feed: benzene, naphtha. Product: aniline (6[illegible]00 mt/y).

CAPUAVA CARBONOS INDUSTRIAIS SA

Mauá, São Paulo. Feed: ethylene tar. Product: carbon black (57,000 mt/y).

CELBRAS QUIMICA E TEXTIL SA

Aratu, Bahia. Feed: dimethyl terephthalate, glycol. Product: polyester (6,000 mt/y).

Camaçari, Bahia. Feed: acrylonitrile, maleic anhydride, dimethylformamide. Product: acrylics (14,000 mt/y).

Poços de Caldas. Feed: glycol, terephthalic acid. Product: polyester (33,000 mt/y).

CIA. DE CARBONOS COLOIDAIS

Candeias, Bahia. Feed: heavy aromatic hydrocarbons. Product: carbon black (56,000 mt/y).

CIQUINE—Cia. Indústrias Químicas do Nordeste

Camaçari, Bahia. Feed: benzene, orthoxylene, phthalic anhydride, 2-ethyl hexanol, propylene. Products: maleic anhydride (6,400 mt/y), phthalic anhydride (28,000 mt/y), plasticizers (10,000 mt/y), propylene (38,800 mt/y).

COMPANHIA BRASILEIRA DE ESTIRENO

Cubatão, S.P. Feed: benzene, ethanol, ethylene. Products: ethylene (4,800 mt/y), ethylbenzene (93,000 mt/y), ethylchloride (500 mt/y), styrene (80,000 mt/y), toluene (3,200 mt/y).

COPAMO—CONSÓRCIO PAULISTA DE MONÓMERO SA

Santo André. Feed: ethylene. Product: vinyl chloride (130,000 mt/y).

COPENE

Camaçari, Bahia. Feed: gas oil, naphtha. Products: aromatics (200,000), benzene (222,000 mt/y), butadiene (79,000 mt/y), butylenes (46,000 mt/y), ethylene (460,000 mt/y), orthoxylene (70,000 mt/y), MTBE (66,000 mt/y), paraxylene (130,000 mt/y), propylene (272,000 mt/y), solvent (45,000 mt/y), toluene (30,000 mt/y), xylene mix (70,000 mt/y).

COPENOR

Camaçari. Feed: methanol. Product: formaldehyde (43,000 mt/y).

COPERBO

Cabo, Pernambuco. Feed: alcohol, butadiene, styrene. Products: acetaldehyde (48,000 mt/y), acetic acid (70,000 mt/y), ethylene (36,000 mt/y), polybutadiene-SBR-TR (72,000 mt/y), vinyl acetate (80,000 mt/y).

COPESUL

Triunfo, RGS. Feed: naphtha. Products: benzene (144,000 mt/y), butadiene (84,000 mt/y), ethylene (490,000 mt/y), propylene (260,000 mt/y), toluene (5[illegible],000 mt/y), xylene mix (63,000 mt/y).

ESTIRENO DO NORDESTE SA

Camaçari, Bahia. Feed: benzene, ethylene. Products: ethylbenzene (180,000 mt/y), polystyrene (100,000 mt/y), styrene (150,000 mt/y), toluene (800 mt/y).

FISIBA

Camaçari, Bahia. Feed: acrylonitrile. Product: acrylics (1,100 mt/y).

HIMONT DO BRASIL

Triunfo. Feed: propylene. Product: polypropylene (75,000 mt/y).

INDÚSTRIAS QUÍMICAS ELETRO CLORO SA

Santo André. Feed: ethylene, vinyl chloride. Products: ethylene (10,500 mt/y), hd polyethylene (82,000 mt/y), polyvinyl chloride (156,000 mt/y), vinyl chloride (34,000 mt/y).

METANOR SA—Metanol do Nordeste

Camaçari, Bahia. Feed: carbon dioxide, natural gas. Product: methanol (70,400 mt/y).

NITRIFLEX SA

Duque de Caxias, Rio de Janeiro. Feed: acrylonitrile, butadiene, styrene. Products: ABS-MBS-SAN (21,000 mt/y), resins, rubber (21,400 mt/y).

NITROCARBONO SA

Camaçari. Feed: ammonia, benzene. Products: caprolactam (45,000 mt/y), cyclohexane (48,000 mt/y), polyamide 6 (1,300 mt/y).

NITROFÉRTIL

Camaçari, Bahia. Feed: natural gas. Products: ammonia (1,107 mt/d), urea (1,050 mt/d).

Laranjeiras, Sergipe. Feed: natural gas. Products: ammonia (907 mt/d), urea (1,100 mt/d).

OXITENO SA INDÚSTRIA E COMÉRCIO

Camaçari, Bahia and Triunfo, RS. Feed: ethylene. Products: ethylene glycol (122,130 mt/y), ethylene oxide (122,500 mt/y).

Mauá, São Paulo. Feed: ethylene. Products: ethylene glycol (25,000 mt/y), ethylene oxide (35,000 mt/y).

PETROFLEX

Duque de Caxias. Feed: butadiene, ethylbenzene, styrene. Products: styrene (60,000 mt/y), SBR (185,000 mt/y).

Triunfo. Feed: benzene, butadiene, ethylene, styrene. Products: ethylbenzene (140,000 mt/y), SBR (40,000 mt/y).

PETROQUÍMICA TRIUNFO SA

Triunfo, Rio Grande do Sul. Feed: ethylene. Product: ld polyethylene (130,000 mt/y).

PETROQUÍMICA UNIÃO SA

Santo André, Capuava. Feed: naphtha. Products: alkybenzene (11,500 mt/y), aromatics (311,500 mt/y), benzene (170,000 mt/y), butadiene (50,000 mt/y), butylenes (59,400 mt/y), carbon black feedstock (5[illegible],000 mt/y), ethylene (360,000 mt/y), orthoxylene (35,000 mt/y), propylene (204,000 mt/y), resins (10,000 mt/y), toluene (40,000 mt/y), xylene mix (55,000 mt/y).

POLIALDEN PETROQUÍMICA SA

Camaçari, Bahia. Feed: ethylene. Product: hd polyethylene (100,000 mt/y).

POLIBRASIL

Mauá, São Paulo. Feed: propylene. Product: polypropylene (90,000 mt/y).

POLIOLEFINAS SA

Capuava, Santo André. Feed: ethylene, vinyl acetate. Product: ethylene-vinyl acetate copolymer and ld polyethylene (110,000 mt/y).

Triunfo, Rio Grande do Sul. Feed: ethylene. Product: ld polyethylene (160,000 mt/y).

POLISUL PETROQUIMICA SA
(40% Hoechst AG)
Triunfo. Feed: ethylene. Product: hd polyethylene (100,000 mt/y).

POLITENO
Camaçari, Bahia. Feed: ethylene, vinyl acetate. Product: ld polyethylene (130,000 mt/y).

PRONOR PETROQUÍMICA SA
Camaçari. Feed: methanol, natural gas, paraxylene, toluene. Products: dimethyl terephthalate (78,800 mt/y), toluene diisocyanate (30,800 mt/y).

PROSINT PRODUTOS SINTÉTICOS SA
Rio de Janeiro. Feed: natural gas. Product: methanol (42,500 mt/y).

RHÓDIA SA
Paulínia. Feed: alcohol, cumene, paraxylene. Products: acetaldehyde (58,500 mt/y), acetic acid (73,000 mt/y), acetone (63,630 mt/y), bisphenol A (17,160 mt/y), butanol (6,000 mt/y), cyclohexane (400 mt/y), isopropanol (7,700 mt/y), phenol (105,000 mt/y), terephthalic acid (110,000 mt/y-produced by Rhodiaco), vinyl acetate (29,000 mt/y).
Santo André. Feed: alcohol. Product: acetic anhydride (26,000 mt/y).

SALGEMA SA
Maceió, Alagoas. Feed: alcohol. Products: ethanol (100,000 mt/y), ethylene (100,000 mt/y).

ULTRAFÉRTIL SA
Araucária. Feed: anhydrous ammonia, asphaltic residue, syngas. Product: ammonia (396,000 mt/y), methanol (7,920 mt/y), urea (495,000 mt/y).
Cubatão. Feed: refinery off gases. Product: ammonia (30,000 mt/y).
Piaçaguera. Feed: naphtha, refinery off gases. Product: ammonia (149,820 mt/y).

UNION CARBIDE DO BRASIL LTDA.
Cubatão, São Paulo. Feed: ethylene. Products: ld polyethylene (128,000 mt/y).

USIMINAS SA
(Usinas Siderúrgicas de Minas Gerais)
Ipatinga. Feed: coke oven gas, coal tar. Products: ammonia (12.3 mt/d), benzene (33.3 mt/d), naphthalene (19 mt/d), toluene (5.3 mt/d), xylene mix (0.7 mt/d).

CANADA

ALBERTA GAS CHEMICALS LTD.
(50% Nova, 50% Carma Developers Ltd.)
Medicine Hat, Alberta. Feed: natural gas. Product: methanol (2,400 mt/d).

ALBERTA GAS ETHYLENE CL
Joffre, Alberta. Feed: ethane. Products: butadiene (59,000 mt/y), ethylene (1,406,000 mt/y), propylene (40,000 mt/y).

BASF CANADA INC.
Cornwall, Ontario. Feed: orthoxylene. Products: phthalic anhydride (30,000 mt/y), plasticizers (25,000 mt/y).

BORDEN CHEMICAL CANADA
Laval, Quebec. Feed: methanol. Product: formaldehyde (25,000 mt/y).
Edmonton, Alberta. Feed: methanol. Product: formaldehyde (35,000 mt/y).

BORG-WARNER (CANADA) LTD
Coburg, Ont. Product: ABS (20,000 mt/y).

CABOT CANADA LTD.
Sarnia, Ont. Feed: heavy fuel oil. Product: carbon black (80,000 mt/y).

CANADIAN FERTILIZERS LTD.
Medicine Hat, Alta. Feed: natural gas. Product: ammonia (979,000 mt/y), urea (644,000 mt/y).
CANCARB LTD.
Medicine Hat, Alta. Feed: natural gas. Product: carbon black (30,000 mt/y).

CELANESE CANADA LTD.
Clover Bar (near Edmonton). Feed: butanes, ethylene, natural gas. Products: acetaldehyde (1,700 mt/y), acetic acid (72,000 mt/y), acetic anhydride (27,000 mt/y), acetone (1,200 mt/y), formaldehyde (38,000 mt/y), methanol (765,000 mt/y), vinyl acetate (52,000 mt/y).

C-I-L INC.
Courtright, Ont. Feed: natural gas. Product: ammonia (720,000 mt/y), urea (140,000 mt/y).
Edmonton, Alta. Feed: ethylene. Product: ld polyethylene, ethylene vinyl acetate (75,000 mt/y).

COLUMBIAN CHEMICALS CO.
Hamilton, Ont. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (70,000 mt/y).

COMINCO LTD.
Carseland, Alta. Feed: natural gas. Product: urea (575,000 mt/y).
Joffre, Alta. Feed: nitrogen, hydrogen. Product: ammonia (350,000 mt/y).

COMMERCIAL ALCOHOLS LTD.
Varennes, Que. Feed: ethylene. Product: ethanol (55,000 mt/y).

CYANAMID CANADA INC.
Niagara Falls, Ont. Feed: natural gas. Products: ammonia (210,000 mt/y).

DOW CHEMICAL OF CANADA INC.
Fort Saskatchewan, Alta. Feed: ammonia, caustic, chlorine, ethylene, hydrogen, natural gas, oxygen. Products: ethanolamines, ethylene dichloride, ethylene glycol, ethylene oxide, lld polyethylene, vinyl chloride.
Sarnia, Ont. Feed: benzene, butadiene, caustic, chlorine, ethylene, hydrogen, natural gas, propylene. Products: ethylbenzene, ld and hd polyethylene, polystyrene, propylene glycol, propylene oxide, styrene, vinyl chloride, SB latex.
Varennes, Que. Feed: butadiene, styrene. Product: SB latex.

DU PONT CANADA INC.
Corunna, Ont. Feed: ethylene. Product: ld & hd polyethylene (235,000 mt/y).

ESSO CHEMICAL CANADA
(Division of Imperial Oil)
Ioco, B.C. Feed: naphtha. Product: xylene (7,000 mt/y).
Redwater, Alberta. Feed: natural gas. Products: ammonia (825,000 mt/y), urea (525,000 mt/y).
Sarnia, Ontario. Feed: natural gas liquids, refinery off gases. Products: benzene (100,000 mt/y), butadione (8,000 mt/y), butylenes (4,000 mt/y), carbon black (65,005 mt/y), ethylene (220,000 mt/y), polyethylene (135,000 mt/y), polyvinyl chloride (90,000 mt/y), propylene (40,000 mt/y), toluene (70,000 mt/y), xylene (30,000 mt/y).

ETHYL CANADA INC.
Corunna, Ont. Feed: ethylene. Products: ethyl chloride (36,000 mt/y).

B.F.GOODRICH CANADA INC.
Fort Saskatchewan, Alta. Product: polyvinyl chloride.
Niagara Falls, Ont. Product: polyvinyl chloride resins.
Scotford, Alta. Product: polyvinyl chloride resins.
Shawinigan, Quebec. Product: polyvinyl chloride resins.

HIMONT CANADA INC.
Varennes, Quebec. Feed: propylene. Product: polypropylene (120,000 mt/y).

NITROCHEM INC.
Maitland, Ontario. Feed: natural gas. Products: ammonia (80,000 mt/y).

NOVACOR CHEMICALS LTD.
Joffre, Alberta. Feed: ethylene. Product: lld polyethylene (360,000 mt/y).
Sarnia, Ont. Feed: ethylene. Products: ld-hd polyethylene (195,000 mt/y).

OCELOT AMMONIA CO.
Kitimat, B.C. Feed: natural gas. Products: ammonia (550 mt/d), methanol (1,200 mt/d).

PETRO-CANADA PRODUCTS
Montreal. Feed: crude oil. Products: benzene (155,000 mt/y), toluene (175,000 mt/y), xylene mix (175,000 mt/y).

POLYSAR LTD.
Cambridge, Ont. Feed: styrene. Product: polystyrene (37,000 mt/y).
Corunna, Ont. Feed: heavy atm. gas oil, vac gas oil, naphtha from crude and condensate, NGLS. Products: aromatics mix (125,000 mt/y), benzene (140,000 mt/y), butadiene (90,000 mt/y), butylenes (130,000 mt/y), ethylene (455,000 mt/y), propylene (330 000 mt/y).
Montreal. Feed: styrene. Product: polystyrene (38,000 mt/y).
Sarnia, Ont. Feed: acrylonitrile, benzene, C_4 streams, ethylene, ethylbenzene, light oil. Products: styrene (270,000 mt/y), SBR-NBR-BR-IIR (262,000 mt/y), toluene (13,000 mt/y).

RECOCHEM INC.
Montreal, Que. Products: benzene, naphthalene, toluene, xylene.

REICHHOLD LTD.
North Bay, Ont. Feed: methanol. Product: formaldehyde (100,000 mt/y).
Port Moody, B.C. Feed: methanol. Product: formaldehyde (15,500 mt/y).
Ste. Therese, Que. Feed: methanol. Product: formaldehyde (15,500 mt/y).
Thunder Bay, Ont. Feed: methanol. Products: formaldehyde (55,000 mt/y).

SHELL CANADA LTD.
Corunna, Ont. Feed: reformate, propylene. Products: benzene (65,000 mt/y), isopropanol (91,000 mt/y), polypropylene (91,000 mt/y), toluene (60,000 mt/y), xylene mix (60,000 mt/y).
Montreal East, Que. Feed: isopropyl alcohol. Product: acetone, C_6, oxysolvents (27,000 mt/y).
Scotford, Alta. Feed: benzene, ethylene. Product: styrene (308,000 mt/y).

SHERRITT GORDON MINES LTD.
Fort Saskatchewan, Alta. Feed: natural gas. Products: ammonia (490,000 mt/y), urea (393,000 mt/y).

SIMPLOT CHEMICAL CL
Brandon, Man. Feed: natural gas. Products: ammonia (600 mt/d), urea (500 mt/d).

SUNCHEM INC.
Sarnia. Feed: crude. Products: benzene (46,000 mt/y), orthoxylene (37,000 mt/y), toluene (207,000 mt/y), xylene mix (190,000 mt/y).

UNION CARBIDE CANADA LTD.
Montreal East, Que. Feed: ethylene. Products: ethylene glycol (82,000 mt/y), ethylene oxide (80,000 m/ty).
Red Deer, Alta. Product: ethylene glycol (250 mt/d).

CHILE

PETROX SA
Talcahuano. Feed: naphtha. Product: ethylene (60,000 mt/y).

CHINA, TAIWAN

CHANG CHUN PETROCHEMICAL CL

Miaoli. Feed: acetic acid, n-isobutanol, vinyl acetate. Products: acetic acid (40,000 mt/y), acrylics (4,000 mt/y), formaldehyde (25,000 mt/y), n-isobutyl acetate (24,000 mt/y), polyvinyl alcohol (40,000 mt/y), polyvinyl butyral (1,000 mt/y).

CHANG CHUN PLASTICS CL

Kaohsiung. Feed: acrylonitrile, methanol, phenol, urea. Products: acrylamide (6,600 mt/y), formaldehyde (33,000 mt/y), polyacrylamide (18,000 mt/y), polyester (2,400 mt/y).

Shin-Chu. Feed: acetone, bisphenol, methanol, phenol. Products: formaldehyde (50,000 mt/y), paraformaldehyde (9,000 mt/y), resin (12,000 mt/y).

CHINA AMERICAN PETROCHEMICAL CL

Lin Yuan. Feed: PX. Product: terephthalic acid (500,000 mt/y).

CHINA PETROCHEMICAL DEVELOPMENT CORP.

Kaohsiung. Feed: cyclohexane, oleum. Products: caprolactam (50,000 mt/y).

Ta-She. Feed: ammonia, propylene, syngas. Product: acetic acid (60,000 mt/y), acrylonitrile (132,000 mt/y), methanol (66,000 mt/y).

Toufen. Feed: benzene, oleum. Product: caprolactam (50,000 mt/y), ethylene, (54,000 mt/y).

CHINA SYNTHETIC RUBBER CORP.

(Licensee of Witco Corp.—Concarb Div.)

Kaohsiung. Feed: indigenous E.B. Product: carbon black (45,000 mt/y).

CHINESE PETROLEUM CORP.

Kaohsiung. Feed: gas oil, naphtha. Products: benzene (355,400 mt/y), butadiene (128,000 mt/y), ethylene (899,000 mt/y), orthoxylene (60,000 mt/y), paraxylene (200,000 mt/y), propylene (475,600 mt/y).

CHIUNGLONG PETROCHEMICAL CL

Kaohsiung. Products: polypropylene glycol (22,000 mt/y), propylene glycol (5,560 mt/y), propylene oxide (15,000 mt/y).

DAIREN CHEMICAL CORP.

Kaohsiung. Feed: acetic acid, ethylene. Product: ethyl acetate (30,000 mt/y), vinyl acetate (100,000 mt/y).

FORMOSA PLASTICS CORP.

Jen-Wu and Lin-Yuan. Products: acrylics (100,000 mt/y), acrylic acid-ecters (28,500 mt/y), hd polyethylene (120,000 mt/y), polyvinyl chloride (594,000 mt/y), vinyl chloride (720,000 mt/y).

FORMOSAN UNION CHEMICAL CORP.

Lin Yuan. Feed: benzene, n-olefin, propylene tetramer. Product: alkylbenzene (50,000 mt/y).

GRAND PACIFIC PETROCHEMICAL CORP.

Ta-She, Kaohsiung. Feed: benzene, ethylene. Products: ABS (20,000 mt/y), styrene (200,000 mt/y).

HO TUNG CHEMICAL CORP.

Jen-Wu, Kaohsiung. Feed: kerosine, light diesel. Product: normal paraffins (40,000 mt/y).

LEE CHANG YUNG CHEMICAL INDUSTRY CORP.

Hsin-Chu, Kaohsiung, Lin-Yuan. Feed: ethylene, propylene, methanol. Products: acetaldehyde (50,000 m/ty), acetone (20,000 mt/y), formaldehyde (80,000 mt/y), isopropanol (50,000 mt/y), methanol (60,000 mt/y).

ORIENTAL UNION CHEMICAL CORP.

Kaoshiung. Feed: ethylene. Products: ethylene glycol (150,000 mt/y), ethylene oxide (117,000 mt/y).

TAIWAN FERTILIZER CL

Miaoli. Feed: natural gas. Products: ammonia (300,000 mt/y), urea (300,000 mt/d).

TAIWAN POLYPROPYLENE CL

Kaohsiung. Feed: propylene. Product: polypropylene (120,000 mt/y).

TAIWAN SYNTHETIC RUBBER CORP.

Ta-Sho, Kaohsiung. Feed: butadiene, styrene. Products: polybutadiene (40,000 mt/y), SBR (100,000 mt/y).

USI FAR EAST CORP.

Kaohsiung. Feed: ethylene. Product: hd polyethylene (80,000 mt/y), ld polyethylene (140,000 mt/y).

COLOMBIA

AMONIACO DEL CARIBE SA

Cartagena. Feed: natural gas. Product: ammonia (350 mt/d).

CABOT COLOMBIANA SA

(subsidiary of Cabot Corp., Waltham, Mass.)

Mamonal, Cartagena. Feed: aromatic tar, natural gas. Product: carbon black (20,000 mt/y).

CARBOQUIMICA SA.

Bogota. Feed: orthoxylene, oxoalcohols, coal tar. Products: benzene (2,000 mt/y), naphthalene (1,000 mt/y), phthalic anhydride (12,000 mt/y), plasticizers (20,000 mt/y), solvents (3,000 mt/y), toluene (2,000 mt/y), xylene mix (2,500 mt/y).

DOW COLOMBIANA SA

Cartagena. Feed: styrene. Product: polystyrene (27,500 mt/y).

EMPRESA COLOMBIANA DE PETROLEOS

Barrancabermeja. Feed: crude, natural gas. Products: alkylbenzene (25,000 mt/y), benzene (45,000 mt/y), cyclohexane (30,000 mt/y), ethylene (100,000 mt/y), orthoxylene (9,000 mt/y), polyethylene (55,000 mt/y), toluene (40,000 mt/y), xylene mix (36,000 mt/y), solvents (55,000 mt/y).

MONOMEROS COLOMBO VENEZOLANOS SA

(affiliate of DSM)

Barranquilla. Product: caprolactam (22,000 mt/y).

PETROQUIMICA COLOMBIANA SA

Mamonal, Cartagena. Feed: vinyl chloride. Products: polyvinyl chloride (102,000 mt/y).

POLICOLSA (owned by Ecopetrol)

Barrancabermeja. Feed: ethylene. Products: ethylene (100,000 mt/y), ld polyethylene (55,000 mt/y).

PRODUCTOS PETROQUIMICOS

Yumbo, Valle. Feed: aromatic tar. Product: carbon black (18,000 mt/y).

ECUADOR

CIA. QUIMICA BORDEN EQUATORIANA SA

Quito. Feed: methanol. Products: formaldehyde (9,200 mt/y).

EGYPT

AMERIA PETROLEUM REFINING CO.

Ameria. Feed: naphtha. Products: alkylbenzene (40,000 mt/y), benzene (23,000 mt/y), toluene (4,000 mt/y).

EGYPTIAN PETROCHEMICAL CO.

Ameria. Feed: imported ethylene, sodium chloride. Products: polyvinyl chloride (80,000 mt/y), vinyl chloride (100,000 mt/y).

EL NASR d'ENGRAIS et d'INDUSTRIES CHIMIQUES.

Suez-Attaka. Feed: natural gas. Product: ammonia (250 t/d).

Talkha. Feed: natural gas. Product: ammonia (396 t/d), urea (570,000 mt/y).

FINLAND

KEMIRA OY

Oulu. Feed: peat. Products: ammonia (85,000 mt/y), formic acid (20,000 mt/y).

NESTE OY

Porvoo. Feed: alcohols, benzene, cumene, ethylene, FCC gas, glycols, LPG, naphtha, n-hexane, n-pentane, orthoxylene, phthalic anhydride, propylene, pyrolysis gasoline, reformate, styrene, vacuum gas oil, vinyl chloride. Products: acetone (46,000 mt/y), benzene (110,000 mt/y), butadiene (20,000 mt/y), cumene (140,000 mt/y), ethylene (230,000 mt/y), phthalic anhydride (20,000 mt/y), plasticizers (10,000 mt/y), polyester (15,000 mt/y), ld polyethylene (180,000 mt/y), polystyrene (20,000 mt/y), polypropylene (120,000 mt/y), polyvinyl chloride (80,000 mt/y), propylene (170,000 mt/y).

FRANCE

AMMONIAC DE GRAND QUEVILLY

(77.5% CdF Chimie AZF, 22.5% Cofaz)

Grand Quevilly (near Rouen). Feed: natural gas. Product: ammonia (1,000 mt/d).

AMMONIAC SARRO-LORRAIN

(52% CdF Chimie AZF, 27% CSL, 15% Norsolor)

Carling. Feed: natural gas. Product: ammonia (330,000 mt/y).

APPRYL

(51% Atochem, 49% BP Chimie)

Gonfreville. Product: polypropylene (100,000 mt/y).

Lavera. Product: polypropylene (150,000 mt/y).

ATOCHEM

Balan (Ain). Products: ld polyethylene (90,000 mt/y), lld polyethylene (35,000 mt/y).

Chauny. Feed: naphthalene, orthoxylene. Product: phthalic anhydride (80,000 mt/y), plasticizers (70,000 mt/y).

Feyzin. Feed: LPG, naphtha. Products: benzene (100,000 mt/y), butadiene (30,000 mt/y), ethylene (115,000 mt/y), propylene (60,000 mt/y), toluene (40,000 mt/y).

Gonfreville l'Orcher. Feed: LPG, naphtha. Products: benzene (150,000 mt/y), butadiene (60,000 mt/y), ethylbenzene (300,000 mt/y), ethylene (385,000 mt/y), hd polyethylene (80,000 mt/y), ld polyethylene (160,000 mt/y), polystyrene (150,000 mt/y), propylene (200,000 mt/y), styrene (250,000 mt/y).

La Chambre (Savoie). Feed: acetone, ethanol, 2-butanol, isopropanol. Product: isopropanol.

Lacq (Snea plant). Feed: ethane. Products: benzene (70,000 mt/y), ethylbenzene (60,000 mt/y), ethylene (70,000 mt/y), styrene (50,000 mt/y).

Lavera. Feed: LPG, naphtha. Products: aromatics (50,000 mt/y), benzene (65,000 mt/y), butadiene (50,000 mt/y), ethylene (250,000 mt/y), propylene (140,000 mt/y), vinyl chloride (360,000 mt/y).

Mont (near Lacq). Feed: ammonia, ethylene, vinyl acetate. Product: ld polyethylene (75,000 mt/y).

Notre Dame de Gravenchon (Seine Maritime). Feed: n-butenes. Product: 2-butanol (50,000 mt/y).

Saint Auban. Products: polyvinyl chloride (125,000 mt/y), vinyl chloride (120,000), solvents.

Saint Fons, Rhone. Product: polyvinyl chloride (155,000 mt/y).

AZOLACQ

(50% Cofaz, 50% CdF Chimie AZF)

Oissel. Feed: ammonia, carbon dioxide. Product: urea (360 mt/d).

BAYER ELASTOMÈRES

Lillebonne. Feed: butadiene, styrene. Products: polybutadiene (50,000 mt/y), SBR (18,000 mt/y), SBR latex (24,000 mt/y).

BORG WARNER

Villers Saint Sepulcre (Oise). Product: ABS (50,000 mt/y).

BP CHEMICALS LTD.
Wingles. Products: polystyrene (115,000 mt/y), expandable polystyrene (25,000 mt/y).

BP CHIMIE
Lavéra, Martigues. Feed: GPL, naphtha. Products: benzene (85,000 mt/y), butadiene (50,000 mt/y), ethylene (250,000 mt/y), ethylene glycol (165,000 mt/y), ethylene oxide (150,000 mt/y), polyisobutylene (36,000 mt/y), polyethylene (140,000 mt/y), propylene (180,000 mt/y).

CDF CHIMIE AZF
(100% CdF Chimie)
Mazingarbe. Feed: coke oven gas, naphtha. Products: ammonia (220,000 mt/y).
Toulouse. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (150,000 mt/y).

CdF CHIMIE EP
Carling and Lillebonne. Feed: benzols, gazole, naphtha. Products: benzene (330,000 mt/y), butadiene (130,000 mt/y), cyclohexane (65,000 mt/y), ethylbenzene (280,000 mt/y), ethylene (420,000 mt/y), ld polyethylene (210,000 mt/y), propylene (220,000 mt/y), styrene (220,000 mt/y).

CDF CHIMIE RÉSINES
(100% CdF Chimie)
Drocourt. Feed: benzene, butadiene, styrene. Products: maleic-phthalic anhydride (20,000 mt/y), polyester (50,000 mt/y).
Saint Avold. Feed: aromatics. Product: hydrocarbon resins (24,000 mt/y).
Villers Saint Paul (Oise). Feed: benzene. Products: maleic anhydride (12,000 mt/y).

CIE. CHIMIQUE DE LA MEDITERRANEE
(joint venture of BASF and Shell group).
Berre l'Etang. Feed: ethylene. Product: ld polyethylene (105,000 mt/y).

CRD-TOTAL FRANCE
Gonfreville l'Orcher. Feed: crude. Products: benzene (70,000 mt/y), plasticizers (12,000 mt/y), propylene oligomers (40,000 mt/y).

CIE. DU POLYISOPRENE SYNTHETIQUE
Oudalle. Feed: C-5's, isoprene. Products: isoprene-azeotrope (45,000 mt/y), polyisoprene (45,000 mt/y).

COFAZ
Le Havre, Pardies, Rouen, Pierrefitte. Feed: gas. Products: ammonia (730,000 mt/y), urea (190,000 mt/y).

COPENOR-Compagnie Petrochimique du Nord
(60% CdF Chimie EP)
Dunkirk. Feed: naphtha, gazole, LPG. Products: butadiene (75,000 mt/y), ethylene (250-275,000 mt/y), ld polyethylene (275,000 mt/y), lld polyethylene (100,000 mt/y), propylene (120,000 mt/y).

DEGUSSA
Ambès. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

HGD—Huiles, Goudrons et Dérivés
(94% CdF Chimie)
Mariénau. Feed: coal tars. Product: naphthalene (20,000 mt/y).
Vendin le Vieil. Feed: coal tars. Product: naphthalene (25,000 mt/y).

ICI LTD.
Balycourt. Product: plasticizers (75,000 mt/y).

NOROXO
(100% CdF Chimie)
Harnes (Pas-de-Calais). Feed: olefins. Products: oxoalcohols (115,000 mt/y), oxoacids (20,000 mt/y).

NORSOLOR
(100% CdF Chimie)
Saint Avold. Feed: acetone, alcohols, ammonia, propylene. Products: acrylic acid (100,000 mt/y), acrylonitrile (90,000 mt/y), acrylic-esters (200,000 mt/y).

ORGANICHIM.
(100% CdF Chimie)
Toulouse. Product: formaldehyde (25,000 mt/y).
Villers St. Paul. Product: formaldehyde (50,000 mt/y).

PEC-RHIN
(50% CdF Chimie AZF, 50% BASF).
Ottmarsheim. Feed: natural gas. Product: ammonia (180,000 mt/y).

PETROSYNTHESE SA
(35% Chevron Chemical Co., 35% CFR, 30% Rhone-Poulenc)
Gonfreville. Feed: benzene, propylene. Products: alkylbenzene (100,000 mt/y).

POLYSAR FRANCE SA.
Strasbourg. Feed: acrylonitrile, benzene, butadiene, ethylene. Products: SBR latex, nitrile rubber (160,000 mt/y).

RHONE POULENC
Pardies. Feed: natural gas, methanol. Products: acetic acid (300,000 mt/y), vinyl acetate (160,000 mt/y).
Pont de Claix. Product: bisphenol A (60,000 mt/y).
Roussillon. Feed: acetic acid, benzene, propylene. Products: acetone (60,000 mt/y), cumene (145,000 mt/y), phenol (100,000 mt/y).

SHELL CHIMIE
Berre l'Etang. Feed: gas oil, LPG, naphtha. Products: acetone, benzene (60,000 mt/y), butadiene (80,000 mt/y), ethylene (380,000 mt/y), isopropanol (108,000 mt/y), ld polyethylene (105,000 mt/y), polypropylene (120,000 mt/y), polystyrene (50,000 mt/y), polyvinyl chloride (145,000 mt/y), propylene (200,000 mt/y), toluene (12,000 mt/y), BR (50,000 mt/y), SBR (85,000 mt/y), TR (30,000 mt/y).

SOCABU-SOCIETE DU CAOUTCHOUC BUTYL
Notre Dame de Gravenchon. Feed: refinery products. Products: butyl rubber (52,000 mt/y), ethylene-propylene rubber (50,000 mt/y).

SOCIÉTÉ ARTESIENNE DE VINYLE
(DSM subsidiary)
Mazingarbe. Product: polyvinyl chloride (195,000 mt/y).

SOCIÉTÉ CHIMIQUE DE DIEUZE
(100% CdF Chimie EP)
Dieuze. Feed: styrene. Product: polystyrene (75,000 mt/y).
Ribecourt. Feed: styrene. Product: polystyrene (110,000 mt/y).

SOCIÉTÉ DES ENGRAIS DE L'ILE DE FRANCE
(50% CdF Chimie AZF, 50% Grande Paroisse)
Nangis. Feed: natural gas. Product: ammonia (300,000 mt/y).

SOCIÉTÉ DU CHLORURE DE VINYLE DE FOS
(60% Shell Chimie, 40% Atochem)
Fos sur Mer (Bouches du Rhône). Feed: chlorine, ethylene. Product: vinyl chloride (200,000 mt/y).

SOCIÉTÉ DU POLYETHYLENE DE FOS
(100% Shell)
Fos sur Mer (Bouches du Rhone). Feed: ethylene. Product: ld polyethylene (100,000 mt/y).

SOCIÉTÉ FRANCAISE EXXON CHEMICAL
Notre Dame de Gravenchon. Feed: refinery products. Products: butadiene (70,000 mt/y), ethylene (300,000 mt/y), propylene (220,000 mt/y), solvents (60,000 mt/y).

SOCIÉTÉ FRANCAISE HOECHST
Cuise-LaMotte. Feed: methanol. Product: formaldehyde (12,000 mt/y).
Lillebonne. Feed: ethylene. Product: acetaldehyde (98,000 mt/y), polypropylene (70,000 mt/y).

SOCIÉTÉ NORMANDE DE L'AZOTE
(56% Cofaz, 44% CdF Chimie AZF)
Gonfreville. Feed: naphtha, natural gas. Products: ammonia (330,000 mt/y), urea (250,000 mt/y).

SODES—Société d'Ethanol de Synthèse
(34% Atochem, 34% SFECI, 31% Beghin Say)
Lillebonne. Product: ethanol (120,000 mt/y), ether (10,000 mt/y).

SOLVAY & CIE.
Sarralbe. Feed: ethylene, propylene. Products: hd polyethylene, polypropylene.
Tavaux. Feed: ethylene. Products: polyvinyl chloride, vinyl chloride.

UNITED CHEMICAL FRANCE
Port Jerome. Feed: aromatic oils. Product: carbon black (86,000 mt/y).

USINES LAMBIOTTE
(100% Atochem)
Premery. Products: acetic acid (3,500 mt/y), carbon black (20,000 mt/y), solvents (15,000 mt/y).

GERMANY

BASF AG
Ludwigshafen. Feed: fuel oil, naphtha, natural gas. Products: acetic acid (40,000 mt/y), acetylene (85,000 mt/y), acrylic acid (210,000 mt/y), ammonia (700,000 mt/y), butanols (220,000 mt/y), caprolactam (150,000 mt/y), ethylbenzene (350,000 mt/y), ethylene (450,000 mt/y), ethylene oxide (150,000 mt/y), formaldehyde (1,200,000 mt/y), melamine (40,000 mt/y), methanol (240,000 mt/y), higher oxoalcohols (100,000 mt/y), 2-ethylhexanol (150,000 mt/y), phthalic anhydride (85,000 mt/y), polyamide (worldwide—100,000 mt/y), ld polyethylene (18,000 mt/y), polyisobutylene (6,000 mt/y), polypropylene (10,000 mt/y), polystyrene (265,000 mt/y), polyvinyl chloride (150,000 mt/y), propanol (25,000 mt/y), propylene (240,000 mt/y), propylene glycol (40,000 mt/y), propylene oxide (75,000 mt/y), styrene (500,000 mt/y), urea (480,000 mt/y), vinyl chloride (100,000 mt/y), plasticizers (220,000 mt/y).

BAYER AG
Leverkusen. Products: formaldehyde (9[illegible],000 mt/y), maleic anhydride (11,000 mt/y), phthalic anhydride (50,000 mt/y).

BP BENZIN UND PETROLEUM AG UND CALIFORNIA CHEMICAL GmbH oHG.
(owned jointly by Chevron Chemical Company and BP Benzin und Petroleum AG)
Dinslaken. Feed: reformate. Products: orthoxylene (24,000 mt/y), paraxylene (20,000 mt/y).

CHEMISCHE WERKE SAARLOTHRINGEN
(100% CdF Chimie)
Perl/Besch. Feed: ammonia. Products: formaldehyde (44,000 mt/y), urea (200,000 mt/y), resins (12,000 mt/y).

COLUMBIAN CARBON DEUTSCHLAND
Hamburg. Feed: oil. Product: aromatics mix (40-80,000 mt/y).

CONDEA CHEMIE GmbH
(owned by Conoco Inc. and Deutsche Texaco AG)
Brunsbüttel. Feed: ethylene, hydrogen. Products: synthetic straight chain primary fatty alcohols (75,000 mt/y).

DEGUSSA AG
Bruchhausen. Feed: methyl alcohol. Product: formaldehyde.
Kalscheuren. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.
Mainz-Mombach. Feed: methyl alcohol. Product: formaldehyde.

FERTILIZERS AND CHEMICALS, TRAVANCORE LTD. (FACT) and FACT ENGINEERING AND DESIGN ORGANIZATION (FEDO)

Ambalamedu (near Cochin), Kerala. Feed: naphtha. Products: ammonia (198,000 mt/y), urea (330,000 mt/y).

Udyogamandal (near Cochin), Kerala. Feed: naphtha. Products: ammonia (112,200 mt/y).

GARWARE NYLONS LTD.

Pimpri, Poona. Feed: caprolactam, dimethyl terephthalate, ethylene glycol. Products: nylon 6 (4,830 mt/y), polyamide (360 mt/y), polyester (1,576 mt/y).

GUJARAT NARMADA VALLEY FERTILIZERS CL

Narmadanagar, Bharuch. Feed: fuel oil. Products: ammonia (1,350 mt/d), methanol (60 mt/d), urea (1,800 mt/d).

GUJARAT STATE FERTILIZERS CL

Fertilizernagar (near Baroda). Feed: acetone, benzene, caprolactam, fuel oil, hydrogen cyanide, naphtha, natural gas, urea. Products: ammonia (348,000 mt/y), caprolactam (20,000 mt/y), melamine (5,000 mt/y), nylons (4,000 mt/y), urea (370,800 mt/y).

HERDILLIA CHEMICALS LTD.

Thane, Bombay. Feed: benzene, propylene, orthoxylene, 2-ethyl hexanol. Products: acetone (11,430 mt/y), cumene (29,800 mt/y), phenol (19,050 mt/y), phthalic anhydride (8,600 mt/y), plasticizers (9,500 mt/y), solvents (2,400 mt/y), styrene (900 mt/y).

HINDUSTAN FERTILIZER CORP. LTD.

Barauni (Bihar). Feed: naphtha. Products: ammonia (600 mt/d), urea (1,000 mt/d).

Durgapur. Feed: naphtha. Products: ammonia (600 mt/d), urea (1,000 mt/d).

Haldia. Feed: fuel oil. Products: ammonia (600 mt/d), methanol (125 mt/d), urea (500 mt/d).

Namrup (Assam). Feed: natural gas. Products: ammonia (1,400 mt/d), urea (2,167 mt/d).

HINDUSTAN ORGANIC CHEMICALS LTD.
(Government of India enterprise).

Rasayani and Cochin. Products: acetic acid (1,330 mt/y), acetic anhydride (2,000 mt/y), acetone (24,640 mt/y), formaldehyde (15,000 mt/y), phenol (40,000 mt/y), propylene (7,000 mt/y).

HINDUSTAN POLYMERS
(A unit of McDowell & CL)

Visakhapatnam. Feed: benzene, molasses. Products: ethylene (3,300 mt/y), styrene (15,000 mt/y), polystyrene (12,500 mt/y).

IEL LTD.

Kanpur, Uttar Pradesh. Feed: naphtha. Products: ammonia (411,000 mt/y), urea (675,000 mt/y).

ILAC LTD.
(100% Ahmedabad Mfg. & Calico Printing CL)

Bombay. Feed: acetylene. Product: polyvinyl chloride (25,000 mt/y), vinyl chloride (6,500 mt/y).

INDIAN FARMERS FERTILIZER COOPERATIVE

Kalol, Gujarat. Feed: natural gas. Products: ammonia (300,300 mt/y), urea (396,000 mt/y).

Phulpur, Uttar Pradesh. Feed: ammonia. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

INDIAN OIL CORP. LTD.

Gujarat, Baroda. Feed: reformate. Products: benzene (50,000 mt/y), toluene (20,000 mt/y).

INDIAN PETROCHEMICALS CORP. LTD.

Baroda, Gujarat. Feed: naphtha. Products: acrylonitrile (24,000 mt/y), alkylbenzene (30,000 mt/y), benzene (23,600 mt/y), butadiene (22,000 mt/y), carbon black feedstock (17,900 mt/y), dimethyl terephthalate (30,000 mt/y), ethylene (130,000 mt/y), ethylene dichloride (100,000 mt/y), ethylene glycol (20,000 mt/y), ethylene oxide (5,000 mt/y), normal paraffins (25,000 mt/y), orthoxylene-mixed xylene (23,500 mt/y), paraxylene (17,000 mt/y), polybutadiene rubber (20,000 mt/y), ld polyethylene (80,000 mt/y), polypropylene (30,000 mt/y), polyvinyl chloride (55,000 mt/y), propylene (81,300 mt/y), solvents (20,000 mt/y), vinyl chloride (57,300 m/ty).

MADRAS FERTILIZERS LTD.

Manali. Feed: sr naphtha. Products: ammonia (247,500 mt/y), urea (292,000 mt/y).

MYSORE PETROCHEMCIALS LTD.

Raichur, Karnataka. Feed: orthoxylene. Product: phthalic anhydride (9,000 mt/y).

NAGARJUNA FERTILIZERS AND CHEMICALS LTD.

Kakinada. Feed: naphtha, natural gas. Products: ammonia (900 mt/d), toluene (1,500 mt/d)

NATIONAL FERTILIZERS LTD.

Bhatinda, Punjab. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), urea (511,500 mt/y).

Naya Nangal, Punjab. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), methanol (16,500 mt/y), urea (330,000 mt/y).

Panipat, Haryana. Feed: fuel oil, low sulfur heavy stock. Products: ammonia (297,000 mt/y), urea (511,500 mt/y).

NATIONAL ORGANIC CHEMICAL INDUSTRIES LTD.

Thane. Feed: naphtha. Products: acetone (14,000 mt/y), benzene (17,000 mt/y), butadiene (7,200 mt/y), butanol (6,000 mt/y), ethylene (63,000 mt/y), ethylene dichloride (50,000 mt/y), ethylene glycol-diethylene glycol (11,000 mt/y), ethylene oxide (14,000 mt/y), isopropanol (4,000 mt/y), oxoalcohols (10,000 mt/y), polyvinyl chloride (21,500 mt/y), propylene (37,000 mt/y), vinyl chloride (30,000 mt/y).

PHILLIPS CARBON BLACK LTD.
(owned by Phillips Petroleum, Duncan Bros. CL, and public)

Durgapur, West Bengal. Feed: heavy oil. Product: carbon black (40,000 mt/y).

POLYCHEM LTD.

Baroda. Feed: acrylonitrile, butadiene, styrene. Product: ABS (2,000 mt/y).

Bombay. Feed: benzene, ethylene. Products: divinyl benzene (150 mt/y), ethylbenzene (17,000 mt/y), ethylene (2,000 mt/y), polystyrene (16,000 mt/y), styrene (14,000 mt/y), toluene (700 mt/y).

Nira (Maharashtra). Feed: acetic acid, ethanol, molasses, oxygen. Product: ethanol (7,270 mt/y), ethylene (4,000 mt/y), vinyl acetate (10,000 mt/y).

POLYOLEFINS INDUSTRIES LTD. (PIL).

Thane, Maharashtra. Feed: ethylene. Product: hd polyethylene (50,000 mt/y).

RASHTRIYA CHEMICALS & FERTILIZERS LTD.

Chembur, Bombay. Feed: associated gas, naphtha. Products: ammonia (402,600 mt/y), methanol (36,000 mt/y), urea (429,000 mt/y).

Thal, Alibag. Feed: associated gas. Products: ammonia (891,000 mt/y), urea (1,485,000 mt/y).

SHRI AMBUJA PETROCHEMICALS LTD.

Patancheru, Medak District. Feed: orthoxylene. Product: phthalic anhydride (10,000 mt/y).

SHRIRAM FERTILIZERS AND CHEMICALS

Shriram Nagar, Kota. Feed: naphtha. Products: ammonia (200,000 mt/y), polyvinyl chloride (33,000 mt/y), urea (330,000 mt/y).

SOUTHERN PETROCHEMICAL INDUSTRIES CORP. LTD.

Tuticorin, Tamil Nadu. Feed: naphtha. Products: ammonia (352,000 mt/y), urea (512,000 mt/y).

SYNTHETICS AND CHEMICALS LTD.
(with Kilachand Devchand & Co. and Firestone Tire & Rubber Co.)

Bareilly, Uttar Pradesh. Feed: alcohol, benzene, petrobutadiene. Products: acetaldehyde (22,000 mt/y), butadiene (25,200 mt/y), ethylene (4,000 mt/y), styrene (11,200 mt/y), NBR (2,000 mt/y), SBR (33,000 mt/y).

THIRUMALAI CHEMICALS LTD.

Ranipet, Tamil Nadu. Feed: orthoxylene. Products: maleic anhydride (1,000 mt/y), phthalic anhydride (20,000 mt/y).

UNION CARBIDE INDIA LTD.

Bombay. Feed: alcohol, naphtha. Products: acetaldehyde (11,000 mt/y), acetic acid (2,000 mt/y), acetylene (900 mt/y), aromatics mix (5,400 mt/y), benzene (2,800 mt/y), butanol (4,200 mt/y), ethylene (22,450 mt/y), polyethylene (20,425 mt/y), propylene (5,500 mt/y), toluene (2,000 mt/y), solvents (6,000 mt/y).

UNITED CARBON INDIA LTD.

Thane. Feed: lube extracts, naphtha/cracker bottoms. Product: carbon black (35,700 mt/y).

ZUARI AGRO CHEMICALS LTD.
(Birla Gwalior Pvt. Ltd. and public interests)

Zuarinagar. Feed: naphtha. Products: ammonia (220,000 mt/y), urea (340,000 mt/y).

INDONESIA

PERTAMINA
(state oil company)

Bunyu, East Kalimantan. Product: methanol (330,000 mt/y).

Plaju, South Sumatra. Product: polypropylene (20,000 mt/y), terephthalic acid (225,000 mt/y).

PERUM PETROKIMIA GRESIK.

Gresik, Surabaya. Feed: fuel oil. Products: ammonia (3,600 mt/y), urea (45,000 mt/y).

P.T. PUSRI

Palembang, South Sumatra. Feed: natural gas. Product: urea (480,000 mt/y).

P.T. PUPUK KUJANG

Cikampek, Java. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (570,000 mt/y).

ISRAEL

ELECTROCHEMICAL INDUSTRIES (FRUTAROM) LTD.

Near Ako. Feed: ethylene. Products: ethylene dichloride (160,000 mt/y), polyvinyl chloride (90,000 mt/y), vinyl chloride (100,000 mt/y).

FERTILIZERS & CHEMICALS LTD.

Haifa. Feed: LP-gas, naphtha, Bunker C. Products: ammonia (80,000 mt/y), urea (40,000 mt/y).

GADOT PETROCHEMICAL INDUSTRIES LTD.

Haifa Bay. Feed: reformate, pyrolysis gasoline. Products: aromatics mix (150,000 mt/y), benzene (40,000 mt/y), normal paraffins (40,000 mt/y), orthoxylene (15,000 mt/y), paraxylene (20,000 mt/y), phthalic anhydride (12,000 mt/y), toluene (50,000 mt/y), xylene mix (60,000 mt/y).

ISRAEL PETROCHEMICAL ENTERPRISES LTD.

Haifa. Feed: ethylene, styrene. Products: ld polyethylene (100,000 mt/y), polystyrene (16,000 mt/y).

ITALY

AGRIMONT SpA
(Montedison Group)

Ferrara. Feed: natural gas. Products: ammonia (490,000 mt/y), urea (550,000 mt/y).

Porto Marghera. Feed: natural gas. Products: ammonia (175,000 mt/y), urea (180,000 mt/y).

Priolo. Feed: natural gas. Products: ammonia (330,000 mt/y), urea (200,000 mt/y).

San Giuseppe di Cairo. Feed: natural gas. Products: ammonia (170,000 mt/y), urea (200,000 mt/y).

DEUTSCHE EXXON CHEMICAL GmbH

Cologne. Feed: raffinate 1, (spent butenes). Products: butylenes (35,000 mt/y), polyisobutylene (45,000 mt/y).

DEUTSCHE MARATHON PETROLEUM GmbH
(subsidiary of OEMV AG, Vienna, Austria)

Burghausen, Bavaria. Feed: refinery streams. Products: benzene (120,000 mt/y), butadiene-C_4 cut (90,000 mt/y), ethylene (280,000 mt/y), propylene (130,000 mt/y).

DEUTSCHE SHELL AG

Cologne-Godorf. Feed: pyrolysis gasoline, reformate. Products: benzene (400,000 mt/y), orthoxylene (100,000 mt/y), paraxylene (75,000 mt/y), toluene (220,000 mt/y).

DEUTSCHE SOLVAY-WERKE GmbH

Rheinberg. Feed: ethylene. Products: polyvinyl chloride, vinyl chloride.

DEUTSCHE TEXACO AG

Heide. Feed: refinery products. Products: benzene (34,000 mt/y), butylenes (28,000 mt/y), ethylbenzene (11,000 mt/y), ethylene (80,000 mt/y), MTBE (12,500 mt/y), orthoxylene (12,000 mt/y), parametaxylene (38,000 mt/y), propylene (55,000 mt/y), toluene (75,000 mt/y).

Meerbeck und Duisburg. Feed: refinery products and chemicals. Products: acetone (36,000 mt/y), alkylbenzene (25,000 mt/y), alkyl chlorides (2,000 mt/y), isopropanol (140,000 mt/y), maleic anhydride (7,500 mt/y), plasticizers (24,000 mt/y), resins (36,000 mt/y), ketones (99,000 mt/y).

DOW CHEMICAL

Rheinmuenster. Products: SB-latex, resins.

Stade. Products: bisphenol, propylene oxide, propylene glycol, resins, solvents.

EC ERDOLCHEMIE GmbH
(owned by Bayer AG and Deutsche BP AG)

Worringen, Cologne. Feed: naphtha. Products: acrylonitrile (280,000 mt/y), ammonia (300,000 mt/y), benzene (200,000 mt/y), butadiene (245,000 mt/y), butylenes (90,000 mt/y), ethanol (40,000 mt/y), ethylene (740,000 mt/y), ethylene glycol (150,000 mt/y), ethylene oxide (150,000 mt/y), propylene (520,000 mt/y), propylene glycol (24,000 mt/y), propylene oxide (135,000 mt/y), toluene (100,000 mt/y).

EVC
(50% ICI, 50% Enichem)

Waldshut. Product: polyvinyl chloride (25,000 mt/y).

Wilhelmshaven. Product: polyvinyl chloride (150,000 mt/y).

HOECHST AG

Frankfurt. Feed: ethylene, propylene, natural gas. Products: acetaldehyde (140,000 mt/y), acetic acid (180,000 mt/y), hd polyethylene (130.000 mt/y), polyvinyl alcohol (25,000 mt/y), vinyl acetate (150,000 mt/y).

Gendorf. Feed: ethylene. Products: ethylene glycol (100,000 mt/y), ethylene oxide (120,000 mt/y), polyvinyl chloride (150,000 mt/y), vinyl chloride (160,000 mt/y).

Gersthofen. Feed: p-xylene, methanol. Product: dimethyl terephthalate (130,000 mt/y).

Kelsterbach. Feed: olefins. Products: ethylene glycol-ethylene oxide (45,000 mt/y), polypropylene (125,000 mt/y).

Knapsack. Feed: olefins. Products: acetaldehyde (150,000 mt/y), acetic acid (70,000 mt/y), acetic anhydride (100,000 mt/y), polypropylene (85,000 mt/y), hd polyethylene (100,000 mt/y), polyvinyl chloride (90,000 mt/y), vinyl chloride (100,000 mt/y).

Muenchsmuenster. Feed: ammonia, ethylene, propylene. Products: acrylonitrile (90,000 mt/y), hd polyethylene (75,000 mt/y).

Offenbach. Feed: p-xylene, methanol. Product: dimethyl terephthalate (95,000 mt/y).

HÜLS

Marl. Products: acetaldehyde (80,000 mt/y), acetic acid (40,000 mt/y), acetylene (120,000 mt/y), alkylbenzene (80,000 mt/y), butanol-n-isobutanol (130,000 mt/y), butylenes (30,000 mt/y), butyraldehyde (310,000 mt/y), cumene (110,000 mt/y), ethanol (130,000 mt/y), ethylbenzene (300,000 mt/y), ethylchloride (30,000 mt/y), ethylene (50,000 mt/y), ethylene dichloride (250,000 mt/y), ethylene glycol (90,000 mt/y), ethylene oxide (150,000 mt/y), isopropanol (110,000 mt/y), maleic anhydride (35,000 mt/y), oxoalcohols-octanol (200,000 mt/y), phthalic anhydride (150,000 mt/y), polyamide 12 (14,000 mt/y), polyester (25,000 mt/y), polyethylene (160,000 mt/y), polypropylene (120,000 mt/y), polystyrene (135,000 mt/y), polyvinyl chloride (380,000 mt/y), propylene glycol (22,000 mt/y), propylene oxide (27,000 mt/y), styrene (250,000 mt/y), vinyl chloride (350,000 mt/y), EPS (60,000 mt/y).

HÜLS TROISDORF AG

Lulsdorf. Products: dimethyl terephthalate (150,000 mt/y), ethylene dichloride (85,000 mt/y).

Steyerberg. Product: dimethyl terephthalate (180,000 mt/y).

PHENOLCHEMIE GmbH

Gladbeck. Feed: cumene. Products: acetone (250,000 mt/y), phenol (400,000 mt/y).

RHEINISCHE OLEFINWERKE GmbH

Wesseling. Feed: gas oil, naphtha. Products: butadiene (150,000 mt/y), ethylene (650,000 mt/y), ethylbenzene (430,000 mt/y), ld polyethylene (400,000 mt/y), hd polyethylene (215,000 mt/y), polyisobutylene (8,000 mt/y), polypropylene (130,000 mt/y), propylene (300,000 mt/y), styrene (420,000 mt/y), SB rubber (30,000 mt/y).

RUHRCHEMIE AG

Oberhausen, Holten. Feed: olefins. Products: normal butyraldehyd (335,000 mt/y), hd polyethylene (80,000 mt/y).

RUHR OEL GMBH
(50% Veba Oel AG, 50% Petróleos de Venezuela SA)

Gelsenkirchen. Feed: gas oil, naphtha, distil resid. Products: ammonia (400,000 mt/y), benzene (320,000 mt/y), cumene (330,000 mt/y), cyclohexane (100,000 mt/y), ethylene (400,000 mt/y), methanol (200,000 mt/y), orthoxylene (110,000 mt/y), n-paraffins (100,000 m/ty), paraxylene (120,000 mt/y), propylene (245,000 mt/y), toluene (90,000 mt/y).

Münchsmünster. Feed: LPG, naphtha. Products: ethylene (200,000 m/ty), propylene (130,000 mt/y).

RUHR STICKSTOFF AG

Brunsbüttel. Feed: heavy fuel oil. Products: ammonia (550,000 mt/y), urea (330,000 mt/y).

UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF AG

Wesseling. Feed: LPG, natural gas, pyrolysis gasoline, reformate, resid, refinery gas, xylene mix. Products: benzene (120,000 mt/y), ethylene (440,000 mt/y), methanol (400,000 mt/y), orthoxylene (32,000 mt/y), paraxylene (72,000 mt/y), propylene (260,000 mt/y), toluene (80,000 mt/y), xylene mix (62,000 mt/y).

WACKER-CHEMIE GmbH

Burghausen/Obb. Feed: ethylene. Products: acetaldehyde, acetic acid, acetic anhydride, ethylene dichloride, plasticizers, polyvinyl acetate, polyvinyl alcohol, polyvinyl chloride, vinyl acetate, vinyl chloride, solvents.

WINTERSHALL AG

Ibbenbüren. Feed: benzene, chlorine, n-paraffins. Product: alkylbenzene (36,000 mt/y).

Lingen-Ems. Feed: reformate, benzene-hydrogen, kerosine. Products: benzene (72,000 mt/y), cyclohexane (100,000 mt/y), normal paraffins (30,000 mt/y).

Mannheim. Feed: pyrolysis-gasoline, reformate. Products: benzene (270,000 mt/y).

GREECE

DOW CHEMICAL

Lavrion. Product: polystyrene.

EKO CHEMICALS CO. AE

Thessaloniki. Feed: naphtha, refinery cuts, vinyl chloride. Products: ammonia (120,000 mt/y), ethylene (15,000 mt/y), ethylene dichloride (35,000 mt/y), normal paraffins (45,000 mt/y), polyvinyl chloride (70,000 mt/y).

HADJILUCAS SA

Halkis. Feed: methanol. Product: formaldehyde (20,000 mt/y).

HUNGARY

BORSODI VEGYI KOMBINÁT

Kazincbarcika. Feed: ethylene, natural gas. Products: ammonia (220,000 mt/y), ethylene dichloride (170,000 mt/y), polyamide (1,300 mt/y), polyvinyl chloride (190,000 mt/y), urea (120,000 mt/y), vinyl chloride (170,000 mt/y).

HUNGARIAN OIL AND GAS TRUST

Százhalombatta. Feed: pyrolysis gasoline, reformate, vac gas oil (FCC unit). Products: benzene (110,000 mt/y), maleic anhydride (10,000 mt/y), orthoxylene (52,000 mt/y), propylene (42,000 mt/y), toluene (110,000 mt/y), xylene mix (48,000 mt/y).

TISZAI VEGYI KOMBINÁT

Leninváros. Feed: naphtha, natural gas. Products: ammonia (265,000 mt/y), butadiene (80,000), ethylene (250,000 mt/y), ld polyethylene (210,000 mt/y), polypropylene (105,000 mt/y), propylene (125,000 mt/y).

INDIA

ADARSH CHEMICALS & FERTILIZERS LTD.

Udhna, Gujarat. Feed: benzene. Product: maleic anhydride (3,000 mt/y).

AHMEDABAD MANUFACTURING & CALICO PRINTING CL

Baroda. Feed: dimethyl terephthalate, ethylene glycol. Product: polyester (7,968 mt/y).

BAKELITE HYLAM LTD.

Sanathnagar, Hyderabad. Feed: phenol, formaldehyde, styrene, maleic-phthalic anhydride, isophthalic acid, propylene glycol. Products: formaldehyde (3,000 mt/y), phenolic resins (1,800 mt/y), polyester resins (1,800 mt/y).

BONGAIGAON REFINERY & PETROCHEMICALS LTD.

Dhaligaon, Assam. Feed: 110-145°C cut naphtha TBP. Products: dimethyl terephthalate (45,000 mt/y), orthoxylene (6,000 mt/y), paraxylene (29,000 mt/y).

CHEMICALS & PLASTICS INDIA LTD.

Krishnagiri. Feed: molasses. Product: ethanol (12,000 mt/y).

Metturdam. Feed: chlorine, ethanol. Products: ethylene (18,700 mt/y), ethylene dichloride (37,000 mt/y), polyvinyl chloride (21,300 mt/y), vinyl chloride (22,000 mt/y).

COROMANDEL FERTILIZERS LTD.
(International Minerals & Chemicals Corp., Chevron Chemical Corp., E.I.D. Parry (India) Ltd.)

Visakhapatnam, Andhra Pradesh. Feed: naphtha. Products: ammonia (114,240 mt/y), urea (125,600 mt/y).

FERTILIZER CORP. OF INDIA LTD.

Gorakhpur, Uttar Pradesh. Feed: naphtha. Products: ammonia (171,000 mt/y), urea (285,000 mt/y).

Ramagundam, Andhra Pradesh. Feed: coal. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

Sindri, Bihar. Feed: fuel oil. Products: ammonia (297,000 mt/y), urea (330,000 mt/y).

Talcher, Orissa. Feed: coal. Products: ammonia (297,000 mt/y), urea (495,000 mt/y).

ASHLAND CHEMICAL ITALIANA SpA

Milan. Products: acrylics (1,000 mt/y), alkyds (8,000 mt/y).

AUSIND SpA
(Montedison Group)

Castellanza. Feed: natural gas. Products: formaldehyde (300,000 mt/y), melamine (26,000 mt/y), methanol (120,000 mt/y), urea (100,000 mt/y).

CABOT ITALIANA SpA
(subsidiary of Cabot Corp., Waltham, Mass.)

Ravenna. Feed: petroleum fractions, aromatic tar. Product: carbon black (75,000 mt/y).

CHIMICA DEL FRIULI
(Snia Viscosa group)

Torviscosa (Udine). Product: caprolactam (20,000 mt/y).

CHIMICA DEL TIRSO
(50% EniChem, 50% Montefibre)

Ottana (Sardinia). Feed: paraxylene. Product: terephthalic acid (80,000 mt/y).

CHIMICA DI COLLEFERRO SpA
(Snia Viscosa group)

Colleferro. Product: polyester (40,000 mt/y)

COLUMBIAN CARBON EUROPA SpA

Trecate. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (50,000 mt/y).

DISTILLERIE ITALIANE
(Alusuisse Italia SpA)

San Giovanni Valdarno (Arezzo). Products: phthalic anhydride (25,000 mt/y), polyester (40,000 mt/y), plasticizers (75,000 mt/y).

DOW ITALIA SpA

Livorno. Products: polystyrene, SB-latex.

DUTRAL
(Montedison Group)

Ferrara. Product: EPR (60,000 mt/y).

ENICHEM

Gela. Feed: naphtha, natural gas. Products: acrylonitrile (90,000 mt/y), ammonia (220,000 mt/y), aromatics (150,000 mt/y), benzene (80,000 mt/y), butadiene (40,000 mt/y), ethylene (310,000 mt/y), ethylene dichloride (125,000 mt/y), ethylene glycol (46,000 mt/y), ethylene oxide (40,000 mt/y), ld polyethylene (90,000 mt/y), hd polyethylene (40,000 mt/y), polypropylene (50,000 mt/y), propylene (160,000 mt/y), toluene (90,000 mt/y), urea (200,000 mt/y), xylene mix (80,000 mt/y).

Manfredonia. Feed: natural gas. Products: ammonia (360,000 mt/y), urea (630,000 mt/y).

Pisticci. Feed: natural gas. Products: acrylic esters (7,000 mt/y), methanol (65,000 mt/y).

Ragusa. Feed: ethylene. Product: ld polyethylene (140,000 mt/y).

Ravenna. Feed: natural gas. Products: acetic acid (30,000 mt/y), acetylene (60,000 mt/y), ammonia (310,000 mt/y), butadiene (100,000 mt/y), isoprene (30,000 mt/y), polybutadiene (45,000 mt/y), polyisoprene (30,000 mt/y), polyvinyl acetate (25,000 mt/y), styrene (41,000 mt/y), urea (70,000 mt/y), vinyl acetate (30,000 mt/y), ABS (40,000 mt/y), SBR (150,000 mt/y), SBR latex (30,000 mt/y), nitrile (8,000 mt/y), solvents (100,000 mt/y).

FAR—Fabrica Adesivi Resine

Filago, Bergamo District. Products: formaldehyde (100,000 mt/y), acrylics (20,000 mt/y), polyvinyl acetate (25,000 mt/y).

FTALITAL
(Alusuisse Italia SpA)

Scanzorosciate (Bergamo). Feed: benzene, butane, naphthalene, orthoxylene. Products: maleic anhydride (38,000 mt/y), phthalic anhydride (80,000 mt/y).

ICAM
(100% EniChem)

Priolo. Feed: naphtha, gas oil. Products: ethylene (600,000 mt/y), propylene.

HIMONT ITALIA

Brindisi. Feed: propylene. Product: polypropylene (150,000 mt/y).

Ferrara. Feed: propylene. Product: polypropylene (120,000 mt/y).

Terni. Feed: propylene. Product: polypropylene (180,000).

MOBIL CHIMICA ITALIANA

Naples. Feed: light naphtha, hp reformate. Products: benzene (150,000 mt/y), cyclohexane (55,000 mt/y), orthoxylene (55,000 mt/y), paraxylene (80,000 mt/y), xylene mix (35,000 mt/y).

MONTEDIPE
(Montedison Group)

Ferrara. Product: polyester (6,500 mt/y).

Mantova. Products: acetone (140,000 mt/y), ethylbenzene (350,000 mt/y), ethylene dichloride (200,000 mt/y), maleic anhydride (11,000 mt/y), phenol (230,000 mt/y), polystyrene (270,000 mt/y), styrene (350,000 mt/y).

Porto Marghera. Products: acetic acid (65,000 mt/y), acetylene (40,000 mt/y), caprolactam (100,000 mt/y), ethylene (350,000 mt/y), propylene (180,000 mt/y), vinyl acetate (55,000 mt/y).

Priolo. Products: acetaldehyde (140,000 mt/y), ethylene dichloride (190,000 mt/y), ethylene oxide (15,000 mt/y), propylene glycol (13,000 mt/y), propylene oxide (40,000 mt/y).

Villadossola. Products: acrylics (11,000 mt/y), polyvinyl alcohol (2,000 mt/y), polyvinyl acetate (64,000 mt/y), polyvinyl acetate-ethylene (25,000 mt/y).

SARAS CHIMICA
(60% EniChem, 20% Saras, 20% Montedison)

Sarroch (Sardinia). Feed: refinery feedstock. Products: cumene (200,000 mt/y), ethylbenzene (40,000 mt/y), n-paraffins (160,000 mt/y), orthoxylene (80,000 mt/y), paraxylene (80,000 mt/y).

SARPOM

Trecate (Novara). Feed: intermediate and heavy virgin naphtha. Products: aromatics mix (18,000 mt/y), cyclohexane (3,000 mt/y), normal paraffins (69,000 mt/y).

SELM-Societa Energia Montedison
(Montedison Group)

Priolo. Feed: naphtha, pyrolysis gasoline, propylene. Products: benzene (350,000 mt/y), cumene (270,000 mt/y), ethylbenzene (70,000 mt/y), orthoxylene (75,000 mt/y), paraxylene (130,000 mt/y), toluene (200,000 mt/y).

SOCIETA CHIMICA DAUNA
(50% EniChem, 50% Snia Viscosa)

Manfredonia, Foggia. Feed: toluene. Product: caprolactam (80,000 t/y).

SOLVAY & CIE. SA

Ferrara. Feed: vinyl chloride monomer. Products: polyvinyl chloride.

Rosignano. Feed: ethylene. Product: hd polyethylene.

TECNOPOLIMERI SpA
(Snia Viscosa group)

Ceriano Laghetto (Milan). Feed: caprolactam, PA66. Product: polyamide (27,000 mt/y).

TERNI INDUSTRIE CHIMICHE SpA

Nera Montoro (Terni). Feed: natural gas. Products: ammonia (120,000 mt/y), urea (100,000 mt/y).

VEDRIL
(Montedison Group)

Rho. Feed: ach. Product: acrylics (65,000 mt/y).

JAPAN

ASAHI CHEMICAL INDUSTRY CL

Kawasaki. Products: acrylic esters (20,000 mt/y), acrylonitrile (89,760 mt/y), acrylics (26,950 mt/y), polystyrene (55,200 mt/y), styrene (65,000 mt/y), BR-SBR rubber (129,000 mt/y).

Mizushima. Products: acrylonitrile (128,700 mt/y), ammonia (264,000 mt/y), hd polyethylene (82,000 mt/y), ld polyethylene (96,000 mt/y), polystyrene (145,000 mt/y), styrene (330,000 mt/y), ABS (48,000 mt/y), resins (25,000 mt/y), SB latex (14,000 mt/y).

Nobeoka. Product: nylon 66 (15,000 mt/y).

ASAHI GLASS CL

Chiba. Feed: chlorine, natural gas, propylene. Products: ammonia (46,000 mt/y), propylene glycol (14,000 mt/y), propylene oxide (26,000 mt/y).

Kashima. Feed: chlorine, propylene. Products: propylene glycol (26,000 mt/y), propylene oxide (60,000 mt/y).

ASIA OIL CL

Yokohama. Feed: reformate. Product: benzene (100,000 mt/y).

CHIBA BUTADIENE INDUSTRY CL

Goi-minamikaigan, Chiba. Feed: C_4. Product: butadiene (75,000 mt/y).

CHIBA EDC CL

Chiba. Feed: chlorine, ethylene. Product: ethylene dichloride (80,000 mt/y).

CHIBA VCM CL

Chiba. Feed: ethylene, ethylene dichloride. Product: vinyl chloride (160,000 mt/y).

CHISSO CORP.

Minamata and Mizushima. Feed: acetic acid, ethylene, vinyl chloride monomer. Products: acetic anhydride (5,200 mt/y), polyvinyl chloride (78,900 mt/y).

CHISSO PETROCHEMICAL CORP.

Goi. Feed: ethylene, propylene. Products: oxoalcohols (50,000 mt/y), hd polyethylene (35,000 mt/y), polypropylene (155,700 mt/y), polyvinyl chloride (50,600 mt/y), solvents (44,000 mt/y), plasticizers (53,000 mt/y).

COSMO MATSUYAMA OIL CL

Matsuyama. Feed: naphtha. Products: benzene (10,000 mt/y), toluene (30,000 mt/y), xylene mix (40,000 mt/y), solvents (50,000 mt/y).

DAICEL CHEMICAL INDUSTRIES LTD.

Aboshi. Feed: acetic acid, methanol. Products: acetic acid (225,000 mt/y), acetic anhydride (120,000 mt/y).

Fuji, Shizuoka. Feed: methanol. Product: formaldehyde (190,000 mt/y).

Ohtake, Hiroshima. Feed: acetaldehyde, naphtha, propylene. Products: acetic acid (36,000 mt/y), solvents (50,000 mt/y), plasticizers (10,000 mt/y).

DAINIPPON INK & CHEMICALS INC.

Amagasaki, Chiba, Mikawa, Yokkaichi. Feed: purchased. Products: acrylics (50,000 mt/y), alkyds (42,000 mt/y), butylenes (20,000 mt/y), formaldehyde (100,000 mt/y), polyamide (4,000 mt/y), polyester (70,000 mt/y), polystyrene (84,000 mt/y).

DENKI KAGAKU KOGYO KABUSHIKI KAISHA

Goi, Chiba Prefecture. Feed: acetic acid, benzene, ethylene, vinyl chloride. Products: ABS (55,000 mt/y), ethylbenzene (185,000 mt/y), polystyrene (113,500 mt/y), polyvinyl chloride (65,000 mt/y), styrene (160,000 mt/y).

Ohmi, Niigata Prefecture. Products: polyvinyl alcohol (28,800 mt/y), polyvinyl chloride (24,000 mt/y).

DU PONT-MITSUI POLYCHEMICALS CL
(50% E.I. du Pont de Nemours & Co., 50% Mitsui Petrochemical Ind. Ltd.)

Chiba. Feed: ethylene. Product: ld polyethylene (100,000 mt/y).

Ohtake. Feed: ethylene. Product: ld polyethylene (42,000 mt/y).

FUJI OIL CL

Sodegaura, Chiba. Feed: naphtha. Product: n-paraffins (8,100 mt/y).

GENERAL PETROCHEMICAL INDUSTRIES LTD.

Osaka. Feed: FCC, reformate. Products: benzene (30,000 mt/y), n-butylene (47,000 mt/y), propylene (65,000 mt/y), TBA (46,000 mt/y), toluene (120,000 mt/y), xylene mix (150,000 mt/y).

IDEMITSU PETROCHEMICAL CL

Chiba. Feed: naphtha. Products: benzene (150,000 mt/y), paraxylene (130,000 mt/y), hd polyethylene (82,000 mt/y), polypropylene (80,000 mt/y), polystyrene (30,000 mt/y), styrene (160,000 mt/y).

Tokuyama. Feed: naphtha. Products: benzene (180,000 mt/y), cyclohexane (90,000 mt/y), ethylene (380,000 mt/y), polystyrene (60,000 mt/y), propylene (220,000 mt/y), styrene (91,000 mt/y—joint ownership with Nippon Zeon), toluene (74,000 mt/y), xylene mix (102,000 mt/y).

JAPAN A.G. INTERNATIONAL CHEMICAL CL

(subsidiary of Mitsubishi Gas Chemical CL)

Mizushima. Feed: metaxylene. Product: isophthalic acid (35,000 mt/y).

JAPAN ALDEHYDE CL

Chiba. Feed: ethylene. Product: acetaldehyde (69,000 mt/y).

JAPAN BUTYL CL

Kashima. Product: butyl rubber (25,000 mt/y).

Kawasaki. Feed: isobutylene, isoprene. Product: butyl rubber (75,000 mt/y).

JAPAN ETHANOL CL

Yokkaichi. Feed: ethylene. Product: ethanol (40,000 mt/y).

JAPAN LACTAM CL

Niihama. Feed: cyclohexene, hydroxylamine. Product: caprolactam (72,000 mt/y).

JAPAN PHENOL CL

Kashima. Feed: cumene. Products: acetone (60,000 mt/y), phenol (100,000 mt/y).

JAPAN PHTHALIC CL

(subsidiary of Mitsubishi Gas Chemical CL)

Mizushima. Feed: orthoxylene. Product: phthalic anhydride (75,000 mt/y).

JAPAN SYNTHETIC ALCOHOL CL

Kawasaki. Feed: ethylene. Product: ethanol (40,000 mt/y).

JAPAN SYNTHETIC RUBBER CL

Chiba. Feed: butadiene. Products: polybutadiene resins (10,000 mt/y), polybutadiene rubber (50,000 mt/y).

Kashima. Feed: C_4-C_5 streams. Products: butadiene (50,000 mt/y), isoprene (30,000 mt/y), polyisoprene (30,000 mt/y).

Yokkaichi. Feed: acrylonitrile, C_4 stream, ethylene, propylene, styrene. Products: butadiene (95,000 mt/y), ABS-AES-SAN (127,000 mt/y), polybutadiene, S-SBR (25,000 mt/y), EPR (40,000 mt/y), SB latex (72,000 mt/y), SBR, HSR, NBR (255,000 mt/y).

KASHIMA VINYL CHLORIDE MONOMER CL

Kashima. Feed: ethylene. Product: vinyl chloride (270,000 mt/y).

KAWASAKI KASEI CHEMICALS LTD.

Kawasaki. Feed: crude naphthalene, orthoxylene, oxoalcohols, phthalic anhydride. Products: naphthalene (12,000 mt/y), phthalic anhydride (72,000 mt/y), plasticizers (57,000 mt/y).

KURARAY CL

Kashima. Product: polyisoprene (2,500 mt/m).

Okayama. Feed: ethylene. Products: polyvinyl alcohol (225 mt/d).

Nakajo. Feed: ethylene. Product: polyvinyl alcohol (120 mt/d).

KURARAY YUKA CL

Yokkaichi City. Feed: paraxylene. Product: terephthalic acid (53,000 mt/y).

KYODO SAKUSAN CL

(subsidiary of Daicel Chemical Industries Ltd.)

Aboshi, Himeji, Hyogo. Feed: methanol. Product: acetic acid (225,000 mt/y).

KYOWA YUKA CL

Yokkaichi. Feed: ethylene, propylene. Products: acetaldehyde (125,000 mt/y), acetone (36,000 mt/y), butanol (60,000 mt/y), butyraldehyde (180,000 mt/y), oxoalcohols (100,000 mt/y), plasticizers (100,000 mt/y).

MITSUBISHI CHEMICAL INDUSTRIES LTD.

Kurosaki. Feed: coal, LPG, naphtha. Products: ammonia (264,000 mt/y), caprolactam (84,000 mt/y), carbon black (36,000 mt/y), dimethyl terephthalate (60,000 mt/y), nylons (15,000 mt/y), terephthalic acid (270,000 mt/y), urea (264,000 mt/y).

Mizushima. Feed: naphtha, LPG. Products: acetaldehyde (120,000 mt/y), acetone (55,000 mt/y), acrylonitrile (112,000 mt/y), alphaolefins (25,000 mt/y), benzene (200,000 mt/y), butanol (25,000 mt/y), cyclohexane (100,000 mt/y), maleic anhydride (18,000 mt/y), oxoalcohols (146,000 mt/y), orthoxylene (27,000 mt/y), paraxylene (50,000 mt/y), ld polyethylene (58,000 mt/y), hd polyethylene (69,000 mt/y), polypropylene (35,000 mt/y), propylene (216,000 mt/y), toluene (60,000 mt/y), vinyl chloride (250,000 mt/y), xylene mix (30,000 mt/y).

Yokkaichi. Feed: butadiene, styrene. Products: carbon black (92,000 mt/y), SBR (65,000 mt/y).

MITSUBISHI GAS CHEMICAL CL

Mizushima. Feed: mixed xylene. Products: ethylbenzene (60,000 mt/y), metaxylene (50,000 mt/y), orthoxylene (70,000 mt/y), paraxylene (120,000 mt/y), xylene mix (300,000 mt/y), plasticizers (65,000 mt/y).

Niigata. Feed: natural gas. Products: ammonia (211,200 mt/y), formaldehyde (220,000 mt/y), methanol (264,000 mt/y), urea (198,000 mt/y).

MITSUBISHI MONSANTO CHEMICAL CO.

Yokkaichi. Feed: acrylonitrile, styrene, SBR. Products: acrylonitrile-styrene (32,000 mt/y), ABS (60,000 mt/y), polystyrene (160,000 mt/y).

MITSUBISHI PETROCHEMICAL CL

Kashima. Feed: naphtha. Products: benzene (175,000 mt/y), cumene (140,000 mt/y), ethylene (324,500 mt/y), ethylene glycol (68,000 mt/y), ethylene oxide (66,000 mt/y), melamine (30,000 mt/y), ld polyethylene (135,000 mt/y), polypropylene (120,000 mt/y), styrene (160,000 mt/y), xylene mix (41,000 mt/y).

Yokkaichi. Feed: naphtha. Products: acrylic acid-esters (40,000 mt/y), alkylbenzene (65,000 mt/y), benzene (221,000 mt/y), ethylene (210,700 mt/y), ethylene glycol (86,000 mt/y), ethylene oxide (80,000 mt/y), oxoalcohols (30,000 mt/y), ld polyethylene (50,000 mt/y), polypropylene (70,000 mt/y), styrene (150,000 mt/y), toluene (48,000 mt/y), xylene (13,000 mt/y).

MITSUBISHI YUKA BADISCHE CL

(joint venture of BASF and Mitsubishi Petrochemical CL)

Yokkaichi. Feed: styrene. Products: expandable polystyrene (64,000 mt/y).

MITSUI PETROCHEMICAL INDUSTRIES LTD.

Chiba. Feed: benzene, ethylene, propylene. Products: acetone (108,000 mt/y), aniline (30,000 mt/y), benzene (93,000 mt/y), butanol (53,000 mt/y), butylenes (22,000 mt/y), ethylene glycol (9[illegible],000 mt/y), ethylene oxide (92,000 mt/y), phenol (180,000 mt/y), hd polyethylene (164,100 mt/y), polypropylene (140,000 mt/y), resins (20,000 mt/y), toluene (54,000 mt/y), xylene mix (44,000 mt/y), ethylene-propylene rubber (30,000 mt/y).

Iwakuni-Ohtake. Feed: benzene, ethylene, paraxylene, propylene. Products: acetaldehyde (36,000 mt/y), acetone (36,000 mt/y), benzene (62,000 mt/y), phenol (30,000 mt/y), hd polyethylene (4,200 mt/y), ld polyethylene (45,000 mt/y), lm polyethylene (4,000 mt/y), resins (34,000 mt/y), solvents (9,100 mt/y), terephthalic acid (270,000 mt/y), crude terephthalic acid (320,000 mt/y), toluene (46,000 mt/y), xylene mix (39,000 mt/y)

MITSUI TOATSU CHEMICALS INC.

(Licensee of Witco Corp.—Concarb Div.)

Shimonoseki. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (30,000 mt/y).

Yokoshiba. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (45,000 mt/y).

MIZUSHIMA AROMA CL

(subsidiary of Mitsubishi Gas Chemical CL).

Mizushima. Feed: paraxylene. Product: terephthalic acid (150,000 mt/y).

MIZUSHIMA ETHYLENE KK

(50% Mitsubishi Chemical Industries, 50% Sanyo Petrochemicals).

Mizushima. Feed: LPG, naphtha. Products: ethylene (360,000 mt/y), propylene (216,000 mt/y).

NIHON ALKYLATE CL

(Sumitomo Chemical Co. and Kao Soap Co.).

Niihama. Feed: benzene. Product: linear alkylbenzene (34,000 mt/y).

NIHON OXIRANE CL

(Atlantic Richfield, Sumitomo Chemical, Showa Denko).

Chiba. Feed: ethylbenzene, propylene. Products: propylene oxide (90,000 mt/y), styrene (225,000 mt/y).

NIHON POLYSTYRENE CL

Kawasaki. Feed: styrene. Product: polystyrene (58,000 mt/y).

NIPPON CARBIDE INDUSTRIES CL

Toyama. Feed: acrylic acid-esters, formaldehyde, melamine, styrene, vinyl acetate-chloride. Product: acrylics, polyvinyl chloride.

NIPPON KASEI CHEMICAL CL

Onahama, Fukushima. Feed: creosote oil, methanol. Products: carbon black (28,000 mt/y), formaldehyde (96,000 mt/y).

NIPPON MINING CL

Mizushima. Products: n-paraffins (80,000 mt/y), propylene (80,000 mt/y), xylene mix (70,000 mt/y).

Nagoya. Products: benzene (112,000 mt/y), cyclohexane (80,000 mt/y), paraxylene (100,000 mt/y), propylene (20,000 mt/y), toluene (120,000 mt/y), xylene mix (123,000 mt/y).

NIPPON OIL AND FATS CO.

Oita. Feed: C_4 cut, C_4 LPG. Products: isoparaffins (1,200 mt/y), maleic anhydride (12,000 mt/y), polybutene (8,000 mt/y).

NIPPON PETROCHEMICALS CL

Kawasaki and Ukishima. Feed: LPG, naphtha. Products: benzene (72,000 mt/y), butadiene (60,000 mt/y), isopropanol (60,000 mt/y), n-paraffins (55,000 mt/y), ld polyethylene (95,000 mt/y), toluene (42,000 mt/y), xylene (34,000 mt/y).

NIPPON PETROLEUM DETERGENT CL

(55% Nippon Petrochemicals Co., 45% Chevron Chemical Co.)

Kawasaki. Feed: benzene, n-paraffin, propylene. Product: alkylbenzene (85,000 t/y).

NIPPON POLYURETHANE INDUSTRIAL CL

Shin-Nanyo, Yamaguchi. Product: polyester (7,200 t/y).

NIPPON SHOKUBAI KAGAKU KOGYO CL

Himeji. Feed: benzene, naphthalene, orthoxylene, propylene. Products: acrylic acid-acrylic esters (80,000 mt/y), maleic anhydride (36,000 mt/y), phthalic anhydride (80,000 mt/y).

Kawasaki. Feed: ethylene. Products: ethylene glycol (185,000 mt/y), ethylene oxide (185,000 mt/y).

Suita. Feed: ethylene glycols, phthalic anhydride, styrene. Product: alkyds, polyester (48,000 mt/y).

NIPPON ZEON CL

Kawasaki. Feed: acrylonitrile, butadiene, styrene. Products: NBR (30,000 mt/y), SBR (30,000 mt/y).

Mizushima. Feed: vinyl chloride. Product: polyvinyl chloride (130,000 mt/y).

Takaoka. Feed: vinyl chloride. Product: polyvinyl chloride (80,000 mt/y).

Tokuyama. Feed: C_4 stream. Products: butadiene (140,000 mt/y), polybutylene (48,000 mt/y), EBR (10,000 mt/y), SBR-NBR-HS (190,000 mt/y)

NISSAN CHEMICAL INDUSTRIES LTD.

Toyama. Feed: LPG, naphtha. Products: ammonia (113,000 mt/y), melamine (42,000 mt/y), urea (127,000 mt/y).

NISSAN MARUZEN POLYETHYLENE CL

Goi, Chiba. Feed: ethylene. Product: hd polyethylene (70,000 mt/y).

NISSAN NALKEN CORP.

Chiba, Pref. Feed: benzene, n-paraffin. Product: alkylbenzene (40,000 mt/y).

NISSAN PETROCHEMICAL LTD.

Goi, Chiba. Feed: ethylene. olefins, propylene. Products: oxoalcohols (80,000 mt/y), polyvinyl chloride (55,000 mt/y), vinyl chloride (60,000 mt/y).

NISSO MARUZEN CHEMICAL CL

Goi, Ichihara. Feed: ethylene, propylene oxide. Products: ethylene glycol (70,000 mt/y), ethylene oxide (70,000 mt/y), propylene glycol (22,000 mt/y).

NISSO PETROCHEMICAL INDUSTRIES CL.

Yokkaichi. Feed: ethylene. Products: ethylene glycol (80,000 mt/y), ethylene oxide (63,000 mt/y).

OKAYAMA BUTADIENE CL

(Joint venture of Nippon Zeon CL and Asahi Chemical Industry CL).

Mizushima. Feed: C_4 stream. Product: butadiene (140,000 mt/y).

OSAKA GAS CL

Osaka. Feed: coke oven gas oil. Products: benzene (56,000 mt/y), naphthalene (11,000 mt/y), toluene (5,000 mt/y).

OSAKA PETROCHEMICAL INDUSTRIES LTD.

Sakai, Osaka. Feed: LPG, naphtha. Products: aromatics (60,000 mt/y), benzene (100,000 mt/y), ethylene (300,000 mt/y), propylene (200,000 mt/y), toluene (65,000 m/ty), xylene mix (60,000 mt/y).

SANYO ETHYLENE CL

Mizushima. Feed: naphtha. Products: ethylene (390,000 mt/y), propylene (254,000 mt/y).

SANYO MONOMER CL

(joint venture of Nippon Zeon CL, Asahi Chemical Co., Chisso Corp.)

Mizushima. Feed: ethylene, chlorine. Products: vinyl chloride (175,000 mt/y).

SEITETSU KAGAKU CL

Befu. Products: formaldehyde (32,400 mt/y).

Himeji. Products: formaldehyde (107,000 mt/y), methanol (165,000 mt/y).

SEKISUI... BENEOKU POLYMER CL

(50% Mitsui Toatsu, 35% Nippon Petrochemicals, 15% Asahi Chemicals).

Osaka. Product: polypropylene (80,000 mt/y).

SHIN-DAIKYOWA PETROCHEMICAL CL

(Daikyo Oil CL, Tosoh Corp., Kyowa Hakko Kogyo CL, Dainippon Ink and Chemicals Inc., Industrial Bank of Japan).

Yokkaichi. Feed: naphtha. Products: aromatics (124,000 mt/y), benzene (90,000 mt/y), butadiene (44,000 mt/y), cumene (140,000 mt/y), ethylene (300,000 mt/y), ethylbenzene (130,000 mt/y), propylene (160,000 mt/y), styrene (91,000 mt/y), toluene (60,000 mt/y), xylene mix (50,000 mt/y).

SHIN-ETSU CHEMICAL CL

Kashima. Feed: vinyl chloride. Product: polyvinyl chloride (198,000 mt/y).

Shin-Nanyo. Feed: vinyl chloride. Product: polyvinyl chloride (42,000 mt/y).

SHIN-ETSU VINYL ACETATES CL

Sakai. Feed: acetic acid, ethylene. Product: vinyl acetate (80,000 mt/y).

SHOWA ACETYL CHEMICAL CL

Ohita. Feed: ethylene. Products: acetaldehyde (100,000 mt/y), acetic acid (130,000 mt/y), vinyl acetate (80,000 mt/y).

SHOWA DENKO KK

Kawasaki. Feed: propylene. Products: acrylonitrile (51,200 mt/y), ammonia (197,200 mt/y), propylene (31,000 mt/y).

Ohita. Feed: naphtha. Products: acetaldehyde (100,000 mt/y), acetic acid (130,000 mt/y), butadiene (45,000 mt/y), ethylene (320,000 mt/y), hd polyethylene (112,700 mt/y), ld polyethylene (70,000 mt/y), polypropylene (91,600 mt/y), propylene (170,000 mt/y).

SUMITOMO CHEMICAL CL

Chiba. Feed: butane, naphtha. Products: benzene (100,000 mt/y), ethylene (345,000 mt/y), ld polyethylene (164,000 mt/y), polypropylene (144,000 mt/y), polyvinyl chloride (52,800 mt/y), propylene (252,000 mt/y), toluene (60,000 mt/y), xylene (40,000 mt/y), SBR (50,000 mt/y), ethylene-propylene rubber (35,000 mt/y).

Niihama. Feed: butane, naphtha. Products: acrylic acid-esters (32,000 mt/y), acryionitrile (52,000 mt/y), polyvinyl chloride (26,700 mt/y).

SUN ARROW CHEMICAL CL

(Tokuyama Soda CL)

Tokuyama. Feed: ethylene dichloride. Products: polyvinyl chloride (85,000 mt/y), vinyl chloride (180,000 mt/y).

TAKEDA CHEMICAL INDUSTRIES LTD.

Kashima. Feed: benzene. Proouct: maleic anhydride (16,500 t/y).

Shimizu. Feed: butadiene, styrene maleic anhydride, propylene glycol. Products: polyester (27,500 mt/y), SBR (20,000 mt/y).

TEIJIN HERCULES CHEMICAL CL

Ehime. Feed: paraxylene. Product: dimethyl terephthalate (140,000 mt/y).

Matsuyama. Feed: paraxylene. Product: dimethyl terephthalate (60,000 mt/y),.

Tokuyama. Feed: paraxylene. Product: dimethyl terephthalate (75,000 mt/y).

TEIJIN PETROCHEMICAL INDUSTRIES LTD.

Ehime. Feed: mixed xylenes. Products: orthoxylene (30,000 mt/y), paraxylene (170,000 mt/y).

Tokuyama. Feed: mixed xylene. Products: ethylbenzene (20,000 mt/y), orthoxylene (30,000 mt/y), paraxylene (35,000 mt/y).

TOBU BUTADIENE CL

(50% Japan Synthetic Rubber, 50% Sumitomo Chemical)

Chiba. C_4 stream. Product: butadiene (80,000 mt/y).

TOHO RIKA KOGYO KK

Minato, Nagoya. Feed: methanol, orthoxylene. Product: formaldehyde (80,000 mt/y), phthalic anhydride (30,000 mt/y).

TOKUYAMA PETROCHEMICAL CL

Shin-Nanyo. Feed: ethylene. Products: acetaldehyde (100,000 mt/y), butanol (13,000 mt/y).

TOKUYAMA SODA CL

Tokuyama. Feed: propylene. Products: ethylene dichloride (132,000 mt/y), isopropanol (36,000 mt/y), polypropylene (95,000 mt/y), propylene oxide (36,000 mt/y).

TOKUYAMA STYRENE MONOMER CL

(jointly owned by Idemitsu Petrochemical CL, and Nippon Zeon CL)

Tokuyama. Feed: benzene, ethylene. Product: styrene (91,000 mt/y).

TOMAKOMAI SODA CL

(Nippon Zeon, Hokkaido Soda, Maruzen Petrochemical, Nippon Light Metal, Nissho Iwai, Asahi Denka)

Tomakomai. Feed: ethylene. Product: ethylene dichloride (120,000 mt/y).

TONEN PETROCHEMICAL CL

Kawasaki. Feed: naphtha, LPG. Products: butadiene (105,000 mt/y), butanol (7,700 mt/y), ethylene (350,000 mt/y), hd polyethylene (36,800), propylene (224,000 mt/y), polypropylene (76,000 mt/y).

Wakayama. Feed: reformate. Products: benzene (40,000 mt/y), orthoxylene (65,000 mt/y), paraxylene (90,000 mt/y), toluene (80,000 mt/y).

TOSOH CORP.

Shin-Nanyo, Yamaguchi. Yokkaichi, Mie. Products: ld polyethylene (167,000 mt/y), hd polyethylene (72,000 mt/y), polyvinyl chloride (150,000 mt/y), vinyl chloride (299,000 mt/y).

TOYO CONTINENTAL CARBON LTD.

(subsidiary of Witco Corp.)

Shimonoseki. Feed: heavy aromatic oils. Product: carbon black (15,000 mt/y).

Yokoshiba. Feed: heavy aromatic oils. Product: carbon black (45,000 mt/y).

UBE INDUSTRIES LTD.

Ichihara, Chiba. Feed: butadiene, ethylene. Products: polybutadiene (60,000 mt/y), ld polyethylene (101,000 mt/y).

Sakai, Osaka. Feed: benzene, LPG, LNG, naphtha, propylene. Products: ammonia (234,600 mt/y), caprolactam (90,000 mt/y), cyclohexane (100,000 mt/y), polypropylene (105,000 mt/y), urea (95,200 mt/y).

Ube, Yamaguchi. Feed: benzene. Products: caprolactam (90,000 mt/y), cyclohexane (58,000 mt/y), nylon 6 (24,600 mt/y), nylon 66 (2,400 mt/y), nylon 12 (2,400 mt/y).

UKISHIMA AROMATIC CHEMICALS CL

(50% Nippon Petrochemicals CL, 50% Toray Industries Inc.)

Ukishima. Feed: benzene, C_9s, reformate. Products: cyclohexane (70,000 mt/y), orthoxylene (30,000 mt/y), paraxylene (185,000 mt/y).

UKISHIMA PETROCHEMICALS CL

(50% Nippon Petrochemicals CL, 50% Mitsui Petrochemical Industries)

Ukishima. Feed: LPG, naphtha. Products: ethylene (312,000 mt/y), propylene (172,000 mt/y).

UNITIKA CHEMICAL CO.

Sakai. Feed: vinyl chloride. Product: polyvinyl alcohol (24,000 mt/y).

YUKA MELAMINE CL

Kashima. Feed: urea. Product: melamine (30,000 mt/y).

ZEON ISOPRENE CL

(Subsidiary of Nippon Zeon)

Mizushima. Feed: C_5 stream, isoprene. Products: isoprene (45,000 mt/y), polyisoprene (37,000 mt/y), C_5 resin.

JORDAN

INTERMEDIATES PETROCHEMICALS INDUSTRIES CL

Zarqa. Feed: glycols, maleic-phthalic anhydrides, oxoalcohols, polyvinyl chloride, styrene. Products: polyesters (8,000 mt/y), plasticizers (4,000 mt/y).

KOREA

DAELIM INDUSTRIAL CL

Yeo-Chon, Chun-Nam. Feed: naphtha. Products: benzene (80,000 mt/y) ethylbenzene (130,000 mt/y), ethylene (350,000 mt/y), propylene (167,000 mt/y), styrene (120,000 mt/y), toluene (44,000 mt/y), xylene mix (30,000 mt/y).

DAINONG PETROCHEMICAL INDUSTRY CL
(joint venture Dainong CL, Mitsui Toatsu Chemicals Inc., Toyo Menka Kaisha Ltd.)
Ulsan. Feed: benzene. Product: maleic anydride (12,000 mt/y).

HANKOOK CAPROLACTAM CORP.
Ulsan. Feed: cyclohexane. Product: caprolactam (40,000 mt/y).

HANNAM CHEMICAL CORP.
Ulsan. Feed: acrylonitrile, butadiene, propylene oxide, styrene. Product: ABS (40,000 mt/y), polystyrene (150,000 mt/y), propylene glycol (20,000 mt/y).

ISU CHEMICAL CL
Ulsan. Feed: benzene, n-paraffin, n-olefin, propylene tet. Product: alkylbenzene (100,000 mt/y).

KOHAP CHEMICAL CORP.
Ulsan. Feed: virgin xylene. Products: benzene (30,000 mt/y), orthoxylene (30,000 mt/y), paraxylene (160,000 mt/y).

KOREA FERTILIZER CL
Ulsan. Feed: naphtha. Products: ammonia (195,000 mt/y), melamine (6,000 mt/y), urea (330,000 mt/y).

KOREA KUMHO PETROCHEMICAL CL
Ulsan and Yeochun. Feed: C_4, butadiene, styrene. Products: butadiene (70,000 mt/y), polybutadiene (35,000 mt/y), SBR (130,000 mt/y).

KOREA PETROCHEMICAL INDUSTRIES CL
Ulsan. Feed: ethylene, propylene. Products: hd polyethylene (70,000 mt/y), polypropylene (120,000 mt/y).

KOREA PLASTIC INDUSTRY CORP.
Chinhae, Kunsan, Ulsan. Feed: vinyl chloride. Product: polyvinyl chloride (215,000 mt/y), plasticizers (20,000 mt/y).

KOREA POLYOL CL
Ulsan. Feed: ethylene oxide, propylene oxide. Products: polypropylene glycol (40,000 mt/y), ethylene oxide (5,000 mt/y), polyethylene glycol (1,000 mt/y).

LUCKY ADVANCED MATERIALS INC.
(Licensee of Witco Corp.—Concarb Div.)
Bupyong. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (30,000 mt/y).
Yosu. Feed: heavy aromatic oil, coal tar distillate. Product: carbon black (65,000 mt/y).y).

LUCKY LTD.
Na-Ju and Yeochun. Products: ABS (135,000 mt/y), acrylics (7,000 mt/y), acrylic acid-esters (58,000 mt/y), butanol (17,000 mt/y), oxoalcohols (55,000 mt/y), polystyrene (50,000 mt/y), polyvinyl chloride (280,000 mt/y).

NAMHAE CHEMICAL CORP.
Yosu, Chunnam. Feed: naphtha. Products: ammonia (600,000 mt/y), urea (660,000 mt/y).

SAMKYUNG CHEMICAL CL
Ulsan. Feed: butanol, orthoxylene, phthalic anhydride, 2-ethyl hexanol. Product: maleic anhydride (3,000 mt/y), phthalic anhydride (70,000 mt/y), plasticizers (50,000 mt/y).

TONG SUH PETROCHEMICAL CORP. LTD.
Ulsan. Feed: ammonia, propylene. Product: acrylonitrile (83,000 mt/y).

YONG-NAM CHEMICAL CL
Ulsan. Feed: naphtha. Product: ammonia (310 mt/d), urea (375 mt/d).

YUKONG LTD.
Ulsan. Feed: naphtha. Products: benzene (254,000 mt/y), butadiene (24,000 mt/y), cyclohexane (40,000 mt/y), ethylene (155,000 mt/y), propylene (81,000 mt/y), toluene (270,000 mt/y), xylene mix (297,000 mt/y).

KUWAIT

PETROCHEMICAL INDUSTRIES CO.
Shuaiba. Feed: natural gas. Products: ammonia (3,000 mt/d), urea (2,500 mt/d).

MADAGASCAR

N-REN CORP.
Tamatave. Feed: naphtha. Product: ammonia (175 mt/d).

ZE-R[illegible]
Tamatave. Product: urea (90,000 mt/y).

MALAYSIA

BORDEN CHEMICAL
Prai. Feed: phenol, methanol, urea. Products: formaldehyde (15,000 mt/y), resins.

ESSO MALAYA BERHAD
Port Dickson. Feed: refinery gas, naphtha. Product: ammonia (53,000 mt/y).

MALAYSIAN CARBON SDN. BHD.
(Subsidiary of Cabot Corp.)
Port Dickson. Feed: heavy aromatic oil. Product: carbon black.

MEXICO

CELANESE MEXICANA SA
Cangrejera. Products: acetic acid (108,000 mt/y), acetic anhydride (33,000 mt/y), acetone (60,000 mt/y), butanol (16,000 mt/y), butyraldehyde (90,000 mt/y), vinyl acetate (25,000 mt/y).
Celaya. Products: acetic acid (63,000 mt/y), acetic anhydride (31,000 mt/y), acetone (14,000 mt/y), butanol-n (38,000 mt/y), 2-ethyl hexanol (70,000 mt/y), vinyl acetate (25,000 mt/y).
Cosoleacaque. Product: acrylic acid-esters (26,000 mt/y).
Lerma. Products: phthalic anhydride (23,500 mt/y), solvents-plasticizers (10,100 mt/y).
Ocotlan. Products: polyamide (16,860 mt/y), polyester (9,900 mt/y).
Queretaro. Products: polyamide (7,000 mt/y), polyester (94,000 mt/y).
Toluca. Products: polyamide (12,000 mt/y), polyester (23,600 mt/y).

DERIVADOS MALEICOS SA DE CV
Puebla. Feed: benzene. Product: maleic anhydride (7,000 mt/y).

FENOQUIMIA SA
(75% Industrias Resistol, 25% Promociones Industriales Banamex)
Cosoleacaque, Ver. Feed: cumene, cyanhidric acid, methanol. Products: acetone (23,000 mt/y), acrylics (16,500 mt/y), phenol (38,000 mt/y).

FERTILIZANTES MEXICANOS SA
Camargo. Feed: ammonia, CO_2. Product: urea (75,000 mt/y).
Coatzacoalcos (Pajaritos). Feed: ammonia, carbon dioxide. Product: urea (990,000 mt/y)
Minatitlan. Feed: ammonia, carbon dioxide. Product: urea (302,000 mt/y).
Salamanca. Feed: ammonia, carbon dioxide. Product: urea (386,000 mt/y).

GLICOLES MEXICANOS SA DE CV
Apizaco, Tlaxcala. Feed: ethylene oxide. Product: ethylene glycol (100,000 mt/y).

HULES MEXICANOS SA
(owned by Pemex and Polysar Ltd.)
Altamira, Tam. Feed: styrene, butadiene, acn. Product: SBR (45,000 mt/y).

INDUSTRIAS DERIVADAS DEL ETILENO SA
Puebla, Pue. Feed: ethylene oxide, propylene oxide. Product: ethanolamines (7,200 mt/y), ethylene glycol (30,000 mt/y), propylene glycol (10,000 mt/y).

INDUSTRIAS RESISTOL SA
Coatzacoalcos. Feed: styrene. Product: polystyrene (41,000 mt/y).
Lecheria. Feed: acrylonitrile, butadiene, styrene. Products: ABS (13,300 mt/y), SBR (4,500 mt/y).
Lerma. Feed: butadiene, methanol, styrene monomer. Products: formaldehyde (28,500 mt/y), SBR (16,500 mt/y).
Xicohtzingo. Feed: styrene. Product: polystyrene (26,000 mt/y).

NEGROMEX SA
Salamanca. Feed: aromatic oils, butadiene, styrene. Products: carbon black (49,600 mt/y), rubber (70,000 mt/y).

PETROCEL SA
Altamira, Tamps. Feed: methanol, paraxylene. Products: dimethyl terephthalate (270,000 mt/y), terephthalic acid (55,000 mt/y).

PETROLEOS MEXICANOS
Azcapotzalco. Feed: benzene, propylene tet, refinery gas. Products: alkylbenzene (36,500 mt/y), propylene (27,000 mt/y), propylene tet (17,500 mt/y).
Cadereyta, N.L. Feed: refinery gas. Product: propylene (45,000 mt/y).
Camargo, Chihuahua. Feed: natural gas. Products: ammonia (132,000 mt/y).
Ciudad Madero, Tamaulipas. Feed: benzene, butylenes, ethylene, refinery gas. Products: alkylbenzene (31,600 mt/y), butadiene (55,000 mt/y), ethylbenzene (39,400 mt/y), propylene (61,000 mt/y), propylene tet (19,000 mt/y), styrene (30,000 mt/y).
Cosoleacaque, Veracruz. Feed: natural gas, propylene. Products: acrylonitrile (24,000 mt/y), ammonia (2,380,000 mt/y), paraxylene (40,000 mt/y).
La Cangrejera, Veracruz. Feed: benzene, ethylene, naphtha, propylene. Product: acetaldehyde (100,000 mt/y), aromatics mix (22,000 mt/y), benzene (275,000 mt/y), cumene (40,000 mt/y), ethylbenzene (187,500 mt/y), ethylene (500,000 mt/y), ethylene oxide (100,000 mt/y), orthoxylene (55,000 mt/y), paraxylene (240,000 mt/y), ld polyethylene (240,000 mt/y), propylene (26,900 mt/y), styrene (150,000 mt/y), toluene (365,000 mt/y), xylene mix (360,000 mt/y).
Minatitlan, Veracruz. Feed: benzene, ethylene, naphtha, refinery gas. Products: aromatics mix (44,000 mt/y), benzene (124,250 mt/y), cyclohexane (106,000 mt/y), ethylbenzene (17,550 mt/y), orthoxylene (11,250 mt/y), propylene (53,000 mt/y), toluene (100,000 mt/y), xylene mix (40,610 mt/y).
Pajaritos, Veracruz. Feed: ethylchloride, ethylene. Products: acetaldehyde (44,000 mt/y), ethylene (209,210 mt/y), ethylchloride (414,050 mt/y), ethylene oxide (28,000 mt/y), vinyl chloride (70,000 mt/y).
Poza Rica, Veracruz. Feed: ethylene. Products: ethylene (182,000 mt/y), ld polyethylene (51,000 mt/y), hd polyethylene (100,000 mt/y), propylene (9,400 mt/y).
Reynosa, Tamaulipas. Feed: ethylene. Products: ethylene (27,210 mt/y), ld polyethylene (18,000 mt/y).
Salamanca, Guanajuato. Feed: natural gas, propylene. Products: ammonia (379,000 mt/y), isopropanol (15,000 mt/y), propylene (48,000 mt/y).
Salina Cruz, Oax. Feed: refinery gas. Product: propylene (45,000 mt/y).
San Martin, Texmelucan, Puebla. Feed: benzene, natural gas, propylene tet. Products: alkylbenzene (70,000 mt/y), methanol (171,500 mt/y), propylene tet (80,000 mt/y).
Tula, Hidalgo. Feed: ammonia, natural gas, propylene. Products: acrylonitrile (50,000 mt/y), propylene (45,000 mt/y).

POLICYD SA
Mexico City and Tampico. Feed: vinyl chloride monomer. Product: polyvinyl chloride (125,000 mt/y).

POLIMEROS DE MEXICO SA
Moyotzingo, Puebla. Feed: vinyl chloride monomer. Product: polyvinyl chloride (30,000 mt/y).

POLIOLES SA DE CV
(60% Mexican shareholders, 40% BASF de Mexico)
Lerma (State of Mexico). Feed: ethylene oxide, propylene oxide. Products: ethylene glycol, propylene oxide.

POLIVIN SA DE CV
Celaya, Guanajuato. Feed: methanol, vinyl acetate. Product: polyvinyl alcohol (2,400 mt/y).

SÍNTESIS ORGÁNICAS SA
Apizaco, Tlaxcala. Feed: orthoxylene. Product: phthalic anhydride (30,000 mt/y).
Puebla, Pue. Feed: orthoxylene, 2 ethylhexanol. Products: phthalic anhydride (12,000 mt/y), plasticizers (15,000 mt/y).

UNIVEX SA
(DSM affiliate)
Salamanca, Gto. Product: caprolactam (50,000 mt/y).

MOROCCO

SNEP—Societe Nationale d'Electrolyse et de Petrochemie.
Mohammedia. Products: polyvinyl chloride (25,000 mt/y), vinyl acetate (25,000 mt/y).

NETHERLANDS

AKZO ZOUT CHEMIE NEDERLAND BV
Botlek. Feed: ethylene, chlorine, HCl. Product: vinyl chloride (500,000 mt/y).

ARCO CHEMIE NEDERLAND LTD.
(100% Arco Chemical Co.)
Rotterdam. Feed: isobutane and propylene. Product: butanol (150,000 mt/y), isobutylenes (60,000 mt/y), propylene glycol (50,000 mt/y), propylene oxide (180,000 mt/y).

BREDASE POLYSTYREEN MBV.
Breda. Feed: styrene. Product: polystyrene (150,000 mt/y).

CINDU CHEMICALS BV
Uithoorn (near Amsterdam). Feed: coal tar. Products: carbon black feedstock (10,000 mt/y), naphthalene (10,000 mt/y).

DEGUSSA.
Botlek. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

DOW CHEMICAL EUROPE
Terneuzen. Products: benzene, butadiene, cumene, ethylene, ethylbenzene, ethylene glycol, ethylene oxide, ld-lld polyethylene, polystyrene, propylene, SB-latex, styrene.

DSM
Chemical Products Division
South Limburg. Products: acetylene (2,200 mt/y), acrylonitrile (180,000 mt/y), caprolactam (230,000 mt/y), melamine (60,000 mt/y).
Chemische Industrie Rijnmond
Botlek. Feed: toluene. Product: phenol (160,000 mt/y).
Methanol Chemie Nederland VoF
Delfzijl and Rotterdam. Products: formaldehyde (120,000 mt/y), resins (200,000 mt/y).
Methanor VoF.
Delfzijl. Product: methanol (740,000 mt/y).
Polymer Division
South Limburg. Feed: C_4, C_5, naphtha, gas oil. Products: benzene (200,000 mt/y), butadiene (110,000 mt/y), EPDM rubber (60,000 mt/y), ethylene (850,000 mt/y), MTBE (40,000 mt/y), ld polyethylene (370,000 mt/y), hd polyethylene (220,000 mt/y), polypropylene (140,000 mt/y), polyvinyl chloride (195,000 mt/y), propylene (470,000 mt/y), ABS (50,000 mt/y).

DSM AGRO BV
Geleen. Feed: natural gas. Products: ammonia (800,000 mt/y), urea (480,000 mt/y).
IJmuiden. Feed: natural gas. Product: ammonia (290,000 mt/y).
Rotterdam. Feed: natural gas. Product: ammonia (150,000 mt/y DSM—150,000 mt/y BASF).

HOECHST HOLLAND NV
Vlissingen. Feed: p-xylene, methanol. Product: dimethyl terephthalate (90,000 mt/y).

ICI HOLLAND BV
Rozenburg. Product: polypropylene (120,000 mt/y).

KEMIRA BV
(subsidiary of Kemira Oy)
Rozenburg. Feed: natural gas. Products: ammonia (700,000 mt/y), urea (230,000 mt/y).

NEDERLANDSE STIKSTOF MAATSCHAPPIJ BV
Sluiskil. Feed: natural gas. Products: ammonia (1,500,000 mt/y), urea (780,000 mt/y).

SHELL NEDERLAND CHEMIE BV
Moerdijk. Feed: gas oil, LPG, naphtha. Products: butadiene (115,000 mt/y), ethylbenzene (365,000 mt/y), ethylene (515,000 mt/y), ethylene glycol (130,000 mt/y), ethylene oxide (200,000 mt/y), propylene (330,000 mt/y), propylene oxide (140,000 mt/y), styrene (315,000 mt/y).
Pernis. Feed: naphtha. Products: acetone (150,000 mt/y), bisphenol A (60,000 mt/y), isopropanol (290,000 mt/y), polypropylene (90,000 mt/y), polyvinyl chloride (200,000 mt/y), propylene (125,000 mt/y), SBR (150,000 mt/y).

UCAM VOF
(2/3 DSM, 1/3 Kemira)
Geleen. Feed: natural gas. Product: ammonia (460,000 mt/y).

NEW ZEALAND

PETRALGAS CHEMICALS NZ LTD.
Waitara. Feed: natural gas. Product: methanol (1,450 mt/d).
PETROCHEMICAL CORP. OF NZ LTD.
Kapuni. Feed: natural gas. Products: ammonia (290 mt/d), urea (500 mt/d).

NICARAGUA

QUÍMICA BORDEN CASA
Tipitapa. Feed: methanol. Product: formaldehyde (6,000 mt/y).

NIGERIA

NIGERIAN NATIONAL PETROLEUM CORP.
Ekpan and Kaduna. Feed: FCC decant oil, benzene, ethylene, kerosine, refinery off gas. Products: alkylbenzene (30,000 mt/y), benzene (15,000 mt/y), carbon black (18,000 mt/y), polypropylene (35,000 mt/y).

NORWAY

I/S NORETYL
(51% Norsk Hydro, 49% Statoil)
Rafnes, Bamble. Feed: natural gas liquids. Products: ethylene (390,000 mt/y), propylene (70,000 mt/y).

NORSK HYDRO as
Porsgrunn. Feed: vinyl chloride. Product: polyvinyl chloride (90,000 mt/y).
Rafnes, Bamble. Feed: chlorine, ethylene. Product: vinyl chloride (420,000 mt/y).

NORSK HYDRO NORWAY
Porsgrunn. Feed: natural gas liquids. Product: ammonia (420,000 mt/y).

NORSK KOKSVERK AS
Mo-I-Rana. Feed: coke oven gas. Products: ammonia (40,[illegible]0 mt/y), benzene (5,000 mt/y), crude tar (16,[illegible]0 mt/y).

PAKISTAN

DAWOOD HERCULES CHEMICALS LTD.
Chichoki Mallian. Feed: natural gas. Products: ammonia (210,000 mt/y), urea (345,000 mt/y).

EXXON CHEMICAL PAKISTAN LTD.
Daharki, Dist. Sukkur. Feed: natural gas. Products: ammonia (155,600 mt/y), urea (267,000 mt/y).

PERU

FERTILIZANTES SINTETICOS SA
Lima. Feed: residual oil. Product: ammonia (75 mt/d).

PETROPERU
(Licensee of Witco Corp.—Concarb Div.)
Negro de Humo plant, Talara. Feed: heavy aromatic oil. Product: carbon black (15,000 mt/y).

PETROPERU
Talara. Feed: ammonia-carbon dioxide, FCC bottoms, isopropanol, propylene. Products: acetone (5,600 mt/y), carbon black (7,750 mt/y), isopropanol (11,400 mt/y), urea (510 mt/d).

PHILIPPINES

COLUMBIAN CARBON PHILIPPINES INC.
Bataan. Feed: heavy aromatic hydrocarbons. Product: furnace carbon black (16,000 mt/y).

LMG CHEMICALS INC.
San Pascual, Batangas. Feed: benzene, dodecene. Product: alkylbenzene (22,000 mt/y).

PORTUGAL

COMPANHIA INDUSTRIAL DE RESINAS SINTETICAS (CIRES)
Estarreja. Feed: vinyl chloride. Product: polyvinyl chloride (70,000 mt/y).

COMPANHIA NACIONAL DE PETROQUÍMICA EP
Sines. Feed: naphtha. Products: butadiene (40,000 mt/y), butylenes-raff. 1 (45,000 mt/y), ethylene (300,000 mt/y), propylene (150,000 mt/y).

EPSI—Empresa de Polímeros de Sines
(86% Portuguese State, 13.2% Cdf Chimie)
Sines. Feed: ethylene, propylene. Products: polyethylene (180,000 mt/y), polypropylene (50,000 mt/y).

PETROGAL
Leça da Palmeira. Feed: reformate. Products: benzene (44,000 mt/y), orthoxylene (40,000 m/ty), paraxylene (90,000 mt/y), toluene (140,000 mt/y), xylene mix (10,000 mt/y).

PETROQUÍMICA E GÁS DE PORTUGAL EP
Cabo Ruivo. Feed: alcohol, naphtha, orthoxylene. Products: ammonia (90,000 mt/y), phthalic anhydride (15,000 mt/y), phthalates (20,000 mt/y).

QUIMIGAL—Químicos de Portugal EP
Barreiro-Lavradio. Feed: heavy fuel oil. Products: ammonia (290,000 mt/y), urea (80,000 mt/y).

PUERTO RICO

PHILLIPS PARAXYLENE INC.
Guayama. Feed: mixed xylenes. Product: paraxylene (213,000 mt/y).

PHILLIPS PUERTO RICO CORE
Guayama. Feed: naphtha. Products: cyclohexane (263,000 mt/y), orthoxylene (59,000 mt/y).

QATAR

QATAR FERTILIZER CO.
(75% Qatar General Petroleum Corp., 25% Norsk Hydro a.s.)
Umm Said. Feed: natural gas. Products: ammonia (680,000 mt/y), urea (750,000 mt/y).

QATAR PETROCHEMICAL CL.
(84% QPC, 16% CdF Chimie)
Umm Said. Feed: ethane. Products: ethylene (280,000 mt/y), ld polyethylene (170,000 mt/y), propylene (5,000 mt/y).

SAUDI ARABIA

AL-JUBAIL FERTILIZER CO.
(Sabic with Taiwan Fertilizer Co.)
Al-Jubail. Feed: methane. Product: urea (500,000 mt/y).

AL-JUBAIL PETROCHEMICAL CO.
(50% Exxon Chemical Co.)
Medinat Al-Jubail. Feed: ethylene. Products: high alpha olefin, lld polyethylene, hd polyethylene (270,000 mt/y).

ARABIAN PETROCHEMICAL CO.
(100% Sabic)
Al-Jubail. Feed: ethane, styrene. Product: ethylene (500,000 mt/y).

EASTERN PETROCHEMICAL CO.
(Sabic, Mitsubishi-led Japanese consortium)
Al-Jubail. Feed: ethane. Products: ethylene glycol (300,000 mt/y), polyethylene (130,000 mt/y).

IBN HAYYAN NATIONAL PLASTIC CO.
Al-Jubail. Feed: ethylene, ethylene dichloride. Products: polyvinyl chloride (200,000 mt/y), vinyl chloride (300,000 mt/y).

IBN-SINA NATIONAL METHANOL CO.
(25% Celanese, 25% Texas Eastern)
Al-Jubail. Feed: methane. Product: methanol (700,000 mt/y).

SAUDI ARABIAN FERTILIZER CO.
(Sabic, Safco employees, private Saudi investors)
Al-Dammam-Khobar Highway. Feed: natural gas. Products: ammonia (600 mt/d), melamine (60 mt/d), urea (1,000 mt/d).

SAUDI METHANOL CO.
(Sabic, Mitsubishi-led Japanese consortium)
Al-Jubail. Feed: methane. Product: methanol (600,000 mt/y).

SAUDI PETROCHEMICAL CO.
(50% Pecten Arabian Co.—subsidiary of Shell Oil U.S.)
Al-Jubail. Feed: ethane, benzene. Products: ethanol (281,000 mt/y), ethylene (656,000 mt/y), ethylene dichloride (454,000 mt/y), styrene (295,000 mt/y).

SAUDI YANBU PETROCHEMICAL CO.
(50% Mobil Oil Corp.)
Yanbu. Feed: ethane. Products: ethylene (455,000 mt/y), ethylene glycol (220,000 mt/y), ld polyethylene (100,000 mt/y), hd polyethylene (200,000 mt/y).

SINGAPORE

ETHYLENE GLYCOLS SINGAPORE PL
(50% Government, 30% Japanese interests, 20% Shell)
Pulau Ayer Merbau. Products: ethylene glycol, ethylene oxide.

PHILLIPS PETROLEUM SINGAPORE CHEMICALS LTD.
(60% Phillips Petroleum International Corp., 25% Temasek Holdings Ltd., 10% Sumitomo Chemicals CL, 5% Development Bank of Singapore Ltd.)
Singapore. Feed: ethylene. Product: hd polyethylene (160,000 mt/y).

SHELL EASTERN PETROLEUM PL
(100% Shell)
Pulau Bukom. Products: toluene, xylene mix, solvents.

SOUTH AFRICA

AECI LTD.
Midland, Sasolburg. Feed: coal based acetylene, ethylene. Products: acetylene (47,000 mt/y), ethylene dichloride (56,000 mt/y), ld polyethylene (80,000 mt/y), lld polyethylene (75,000 mt/y), polyvinyl chloride (138,000 mt/y), solvents (22,000 mt/y), vinyl chloride (143,000 mt/y).
Modderfontein. Feed: coal. Products: ammonia (1,000 mt/d), methanol (45 mt/d).

FEDMIS
(division of Sentrachem)
Milnerton. Feed: refinery gas. Product: ammonia (85,000 mt/y).

KARBOCHEM PL
(division of Sentrachem)
Newcastle. Feed: butadiene, styrene. Products: isoprene (50,000 mt/y), polybutadiene (17,500 mt/y), polyisoprene (45,000 mt/y).
Sasolburg. Product: SBR (40,000 mt/y).

NATIONAL CHEMICAL PRODUCTS LTD
(division of Sentrachem)
Germiston and Durban. Feed: benzene, molasses, naphthalene, orthoxylene, styrene. Products: acetaldehyde (35,700 mt/y), acetic acid (28,000 mt/y), ethanol (123,000 mt/y), formaldehyde (57,600 mt/y), maleic anhydride (11,500 mt/y), phthalic anhydride (87,500 mt/y).

SAFRIPOL PTY.
(50% Hoechst)
Sasolburg. Feed: ethylene, propylene. Products: hd polyethylene (85,000 mt/y), polypropylene (44,000 mt/y).

SASOL LTD.
Sasolburg and Secunda. Feed: coal. Product: ethylene (220,000 mt/y).

SENTRACHEM SPECIALTIES DIVISION
Durban and Germiston. Products: alkyds, polyester, polystyrene.

SPAIN

AISCONDEL SA
Monzón (Huesca). Feed: acrylonitrile, butadiene, styrene, vinyl chloride monomer. Products: ABS-SAN (15,000 mt/y), polystyrene (10,000 mt/y), polyvinyl chloride (60,000 mt/y).
Vilaseca (Tarragona). Feed: ethylene, chlorine. Products: polyvinyl chloride (50,000 mt/y), vinyl chloride monomer (150,000 mt/y).

ATOCHEM
Prat de Llobregat. Feed: styrene. Product: ABS with compounds (8,000 mt/y), polystyrene with compounds (60,000 mt/y).

BASF ESPANOLA SA
(wholly owned by BASF)
Tarragona. Feed: acrylates, butadiene, naphtha, orthoxylene, propylene, styrene. Products: butanols (20,000 mt/y), oxoalcohols-2ethylhexanol (28,000 mt/y), phthalic anhydride (16,000 mt/y), polystyrene (20,000 mt/y), plasticizers (40,000 mt/y), solvents (6,600 mt/y).

BORDEN ESPANA SA
Axpe-Erandio. Feed: methanol, phenol, urea. Products: formaldehyde (60,000 mt/y), uf-pf resins (50,000 mt/y).

BRILEN SA
Barbastro. Feed: polyethylene terephthalate. Products: methanol (7,000 mt/y), polyester (25,000 mt/y).

CARBESA
(100% Repsol Quimica)
Algeciras. Feed: heavy aromatic oils. Product: carbon black (25,000 mt/y).

CEPSA—Compañia Española de Petroleos SA
Luchana, Vizcaya. Feed: alcohol, orthoxylene. Products: phthalic anhydride (16,000 mt/y), plasticizers (40,000 mt/y).
San Roque, Cádiz. Feed: naphtha. Products: aromatics mix (20,000 mt/y), benzene (80,000 mt/y), maleic anhydride (13,000 mt/y), orthoxylene (40,000 mt/y), paraxylene (34,000 mt/y), phthalic anhydride (20,000 mt/y), propylene (60,000 mt/y), toluene (130,000 mt/y), xylene mix (120,000 mt/y), solvents (50,000 mt/y).

DOW CHEMICAL IBERICA SA
Bilbao. Products: polystyrene, SB-latex.
Tarragona. Products: benzene, ethylene, hd-ld-lld polyethylene, propylene.

ENFERSA—Empresa Nacional de Fertilizantes SA
Avilés, Asturias. Feed: coke gases. Product: ammonia (90,000 mt/y).
Cartagena, Murcia. Feed: naphtha. Products: ammonia (240,000 mt/y), urea (145,000 mt/y).
Puertollano, Ciudad Real. Feed: naphtha. Products: ammonia (180,000 mt/y), urea (125,000 mt/y).

HISPAVIC INDUSTRIAL SA
Martorell. Feed: vcm. Product: polyvinyl chloride.

INTERQUISA—Intercontinental Quimica SA
(50% Cepsa, 50% Amoco International)
Algeciras. Feed: methanol, paraxylene. Products: dimethyl terephthalate (100,000 mt/y), terephthalic acid (60,000 mt/y).

PETROQUIMICA ESPANOLA SA
(100 % Cepsa)
San Roque (Cádiz). Feed: benzene, kerosine .Products: alkylbenzene (180,000 mt/y), n-paraffins (180,000 mt/y).

PRODUCTOS QUIMICOS DEL MEDITERRÁNEO SA
El Grao, Castellon de la Plana. Feed: cyclohexane. Product: caprolactam (45,000 mt/y).

REPSOL PETROLEO SA
La Coruña. Product: propylene (40,000 mt/y).
Puertollano. Feed: naphtha, refinery gases. Products: benzene (80,000 mt/y), ethylene (210,000 mt/y), propylene (130,000 mt/y).
Tarragona. Feed: LPG, naphtha. Products: ethylene (335,000 mt/y), propylene (165,000 mt/y).

REPSOL QUIMICA SA
Puertollano. Feed: olefins cracker. Products: butadiene (32,000 mt/y), ld-lld-hd polyethylene (195,000 mt/y), polyols (30,000 mt/y), polypropylene (80,000 mt/y), propylene glycol (15,000 mt/y), propylene oxide (50,000 mt/y), styrene 110,000 mt/y).
Santander. Feed: butadiene, styrene. Products: carbon black (40,000 mt/y), SBR-PB (80,000 mt/y).
Tarragona. Feed: olefins cracker. Products: acrylonitrile (90,000 mt/y), butadiene (100,000 mt/y), ld-hd polyethylene (255,000 mt/y).

RESISA—Resinas Sintéticas SA
San Celoni, Barcelona. Feed: maleic anhydride, phthalic anhydrida, paraxylene, solvents. Products: polyester (17,000 mt/y), resins: (alkyd 13,000 mt/y, phenolic 2,000 mt/y, acrylic 1,000 mt/y, p.e.t. 4,000 mt/y).

RIO RODANO SA
Guturribay, Vizcaya. Feed: butadiene, styrene. Product: SBR latex (12,000 mt/y).
Hernani, Guipúzcoa. Feed: chlorine, normal paraffins, vinyl chloride monomer. Products: polyvinyl chloride (30,000 mt/y), plasticizers (3,000 mt/y).
Miranda de Ebro, Burgos. Feed: glycols, maleic anhydride, oxoalcohols, orthoxylene, vinyl chloride monomer. Products: phthalic anhydride (30,000 mt/y), polyester (22,000 mt/y), polyvinyl chloride (75,000 mt/y), plasticizers (18,000 mt/y).

TARRAGONA QUIMICA SA
(100% Hoechst)
Tarragona. Feed: olefins. Products: hd polyethylene (100,000 mt/y), polypropylene (90,000 mt/y), vinyl acetate (75,000 mt/y).

UNION EXPLOSIVOS RIO TINTO
La Rabida, Huelva. Feed: naphtha. Products: acetone (54,000 mt/y), ammonia (390,000 mt/y), benzene (120,000 mt/y), cyclohexane (80,000 mt/y), phenol (87,000 mt/y), urea (237,000 mt/y).

VINICLOR SA
Martorell, Barcelona. Feed: ethylene. Product: vinyl chloride (240,000 mt/y).

SRI LANKA

STATE FERTILIZER MANUFACTURING CORP.
Sapugaskanda. Feed: naphtha. Products: ammonia (86,476 mt/y), urea (138,458 mt/y).

SUDAN

N-REN CORP.
Khartoum. Feed: naphtha. Product: ammonia (175 mt/d).

SWEDEN

DEGUSSA.
Malmoe. Feed: aromatic hydrocarbons, coal tar oil. Product: carbon black.

DOW CHEMICAL
Norrkoeping. Product: SB-latex.

NESTE OXO AB
Stenungsund. Feed: fuel oil, orthoxylene, oxygen, propylene. Products: oxoalcohols (125,000 mt/y), phthalic anhydride (20,000 mt/y), plasticizers (40,000 mt/y).

NESTE POLYESTER AB
Nol. Product: polyester (20,000 mt/y).

NESTE POLYETEN AB
Stenungsund. Feed: ethylene. Product: ld-hd-md-lld polyethylene (440,000 mt/y).

NORSK HYDRO PLAST AB
Stenungsund. Feed: ethylene. Products: polyvinyl chloride (115,000 mt/y), vinyl chloride (110,000 mt/y).

PERSTORP AB
Perstorp. Feed: methanol. Products: formaldehyde (200,000 mt/y), melamine, phenol, urea.

STATOIL PETROKEMI AB.
Stenungsund. Feed: naphtha, propane. Products: ethylene (355,000 mt/y), propylene (170,000 mt/y).

SVENSKA POLYSTYREN FABRIKEN AB
Trelleborg. Feed: styrene. Product: polystyrene (65,000 mt/y).

SWITZERLAND

EVC
(50% ICI, 50% Enichem)
Sins. Product: polyvinyl chloride (45,000 mt/y).

LONZA AG
Visp. Feed: LVN-LPG. Products: acetaldehyde, acetic acid, acetic anhydride, acetylene (15,000 mt/y), ammonia (40,000 mt/y), aniline (3,000 mt/y), ethylene (30,000 mt/y), formaldehyde.

SYRIA

GENERAL FERTILIZER CO.
Katteneh-Homs. Feed: natural gas. Products: ammonia (250,000 mt/y), ethylene (250,000 mt/y), urea (250,000 mt/y).

TRINIDAD

FEDERATION CHEMICALS LTD.
(subsidiary of W.R. Grace & Co.)
Point Lisas. Feed: natural gas. Products: ammonia (231,300 mt/y).

FERTILIZERS OF TRINIDAD & TOBAGO LTD.
Point Lisas. Feed: anhydrous ammonia. Product: ammonia (1,100 mt/d).

TRINIDAD NITROGEN
(49% W. R. Grace & Co., and Government of Trinidad-Tobago)
Point Lisas. Feed: natural gas. Product: ammonia (370,100 mt/y).

TURKEY

BASF-SUMERBANK TURK KIMYA SANAYII AS
Gebze. Feed: methanol. Product: formaldehyde (30,000 mt/y).

SASA
Adana. Feed: methanol, monoethylene glycol, paraxylene. Products: dimethyl terephthalate (70,000 mt/y), polyester (100,000 mt/y).

YARPET—Yarimca Petrokimya
Yarimca-Izmit. Feed: naphtha, NaCl, aromatic oil, benzene, C_4, ammonia, sulfur. Products: alkylbenzene (20,000 mt/y), butadiene (33,000 mt/y), caprolactam (25,000 mt/y), carbon black (30,000 mt/y), ethylene (55,000 mt/y), polybutylene (13,500 mt/y), ld polyethylene (24,300 mt/y), polystyrene (15,000 mt/y), polyvinyl chloride (46,800 mt/y), propylene (39,600 mt/y), styrene (19,450 mt/y), vinyl chloride (48,600 mt/y), SBR (32,150 mt/y).

UNITED KINGDOM

ATOCHEM
Stalybridge. Product: polystyrene with compounds (80,000 mt/y).

BORDEN (U.K.) LTD.
Peterlee. Feed: methanol. Products: formaldehyde (40,000 mt/y), resins.
Southampton. Feed: methanol. Products: formaldehyde (25,000 mt/y).

BP CHEMICALS LTD.
Baglan Bay. Products: benzene concentrate (150,000 mt/y), butadiene (60,000 mt/y), ethanol (155,000 mt/y), ethylene (340,000 mt/y), isopropanol (70,000 mt/y), propylene (200,000 mt/y), styrene (220,000 mt/y), toluene (6,000 mt/y), vinyl acetate (80,000 mt/y).
Carshalton. Products: solvents and plasticizers (15,000 mt/y).
Barry. Product: resins (40,000 mt/y).
Grangemouth. Products: acetone (25,000 mt/y), acrylonitrile (80,000 mt/y), benzene (250,000 mt/y), butadiene (48,000 mt/y), ethanol (155,000 mt/y), ethylene (250,000 mt/y), polybutylenes (48,000 mt/y), hd polyethylene (130,000 mt/y), ld polyethylene (95,000 mt/y), propylene (180,000 mt/y).
Hull. Products: acetic acid (350,000 mt/y), acetone (46,000 mt/y), ethanol (25,000 mt/y), phthalic anhydride (70,000 mt/y).
Wilton. Products: butadiene (90,000 mt/y), ethylene (350,000 mt/y), ld polyethylene (70,000 mt/y), propylene (60,000 mt/y).

CIBA-GEIGY LTD.
Duxford, Cambridge. Feed: methanol. Product: formaldehyde (120,000 mt/y).

CONOCO LTD.
South Killingholme, Humberside. Feed: reformate. Product: benzene (110,000 mt/y).

DOW CHEMICAL
Barry. Product: polystyrene.

ENICHEM ELASTOMERS LTD.
Grangemouth, Scotland. Feed: butadiene, styrene, ethylene, propylene. Products: polybutadiene (45,000 mt/y), polypropylene (5,000 mt/y), SBR (30,000 mt/y), block-SBR (15,000 m/ty), ethylene-propylene rubber (15,000 mt/y).
Hythe, Hampshire. Feed: acrylonitrile, butadiene, ethylbenzene. Product: rubber (150,000 mt/y).

EXXON CHEMICAL LTD.
Fawley. Feed: petroleum fractions. Products: higher olefins (200,000 mt/y), butyl-halobutyl rubber (50,000 mt/y).

EXXON CHEMICAL OLEFINS INC.
Fawley. Feed: petroleum fractions. Products: butadiene (30,000 mt/y), ethylene (105,000 mt/y), isobutylene (60,000 mt/y), propylene (100,000 mt/y).
Mossmorran, Fife. Feed: ethane. Product: ethylene (500,000 mt/y).

IMPERIAL CHEMICAL INDUSTRIES LTD.
Polymers Group
Billingham. Products: acetone (50,000 mt/y), ammonia, methanol (500,000 mt/y), oxoalcohols (250,000 mt/y), phenol (80,000 mt/y), solvents.
North Tees. Products: benzene (400,000 mt/y), cumene, cyclohexane (300,000 mt/y), toluene, xylene mix (340,000 mt/y), solvents.
Wilton. (80% ICI—20% BP): Feed: naphtha, propane. Products: butadiene (90,000 mt/y), ethylene (750,000 mt/y), propylene (350,000 mt/y).
(ICI): Products: ethylene dichloride, ethylene glycol, ethylene oxide (240,000 mt/y), formaldehyde, nylon 66, paraxylene (330,000 mt/y), polyester, polypropylene (200,000 mt/y), terephthalic acid (490,000), plasticizers.

IMPERIAL CHEMICAL INDUSTRIES LTD.
Barry. Product: polyvinyl chloride (90,000 mt/y).
Caster-Kellner, Runcorn. Product: polyvinyl chloride (112,000 mt/y).
Hillhouse, Lancashire. Product: polyvinyl chloride (135,000 mt/y).

NORSK HYDRO POLYMERS LTD.
Aycliffe. Feed: vinyl chloride. Prorluct: polyvinyl chloride (130,000 mt/y).

SEVALCO LTD.
(50% Columbian Chemicals, 50% Phillips Petroleum)
Avonmouth, Bristol. Feed: heavy aromatic oils. Product: furnace and thermal carbon black (70,000 mt/y).

SHELL CHEMICALS U.K. LTD.
Carrington. Feed: ethylene, ethylene oxide, propylene, propylene oxide, styrene. Products: ld polyethylene (105,000 mt/y), polypropylene (110,000 mt/y), polystyrene (71,000 mt/y).
Shell Haven. Feed: benzene. Product: linear alkylbenzene (90,000 mt/y).
Stanlow. Feed: refinery gases. Products: acetone, benzene (450,000 mt/y), butanol, butylenes, isopropanol (100,000 mt/y), propylene (70,000 mt/y), higher olefins (170,000 mt/y), solvents.

UKF FERTILIZERS LTD.
Ince, Chester. Feed: natural gas. Products: ammonia (325,000 mt/y).

UNITED STATES

AGRICO CHEMICAL CO.
(one of the Williams Companies)
Blytheville, Ark. Feed: natural gas. Products: ammonia (320,000 mt/y), urea (300,000 mt/y).
Donaldsonville, La. Feed: natural gas. Products: ammonia (385,000 mt/y), urea (180,000 mt/y).
Fort Madison, Iowa. Feed: natural gas. Product: ammonia (310,000 mt/y).
Verdigris, Okla. Feed: natural gas. Products: ammonia (770,000 mt/y), urea (370,000 mt/y)

AIR PRODUCTS AND CHEMICALS INC.
Calvert City, Ky. Feed: vinyl acetate, vinyl chloride. Products: acetic acid (54,545 mt/y), polyvinyl alcohol (52,272 mt/y), polyvinyl chloride (136,116 mt/y).
New Orleans, La. Feed: natural gas. Product: ammonia (280,000 mt/y).
Pensacola, Fla. Feed: ammonia, natural gas, vinyl chloride. Products: ammonia (94,000 mt/y), methanol (180,000 mt/y), polyvinyl chloride (90,700 mt/y), urea (28,000 mt/y).

ALLIED-SIGNAL INC.

Baton Rouge, La. Product: hd polyethylene (514,000 mt/y).

Chesterfield, Va. and Columbia, S.C. Product: nylons (225,000 mt/y).

Geismar, La. Feed: ethane, propane. Products: butadiene (16,000 mt/y), ethylene (325,000 mt/y), propylene (21,000 mt/y). (50% Allied, 50% Union Texas Petroleum).

Hopewell, Va. Product: ammonia (330,000 mt/y), caprolactam (285,000 mt/y).

Moncure, N.C. Product: polyester (50,000 mt/y).

Philadelphia. Products: acetone (180,000 mt/y), phenol (290,000 mt/y).

AMERICAN CYANAMID CO.

Fortier, La. Feed: natural gas, propylene. Products: acrylonitrile (122,470 mt/y), ammonia (610,000 mt/y), melamine (31,750 mt/y).

AMOCO CHEMICAL CO.

Cedar Bayou, Tex. Feed: propylene. Product: polypropylene (199,200 mt/y).

Chocolate Bayou, Tex. Feed: ethane, ethylene, naphtha, propane, propylene. Products: aromatics (85,000 mt/y), butadiene (91,000 mt/y), ethylene (975,000 mt/y), hd polyethylene (176,500 mt/y), polypropylene (309,000 mt/y), propylene (390,000 mt/y).

Cooper River, S.C. Feed: paraxylene. Product: terephthalic acid (623,000 mt/y).

Decatur, Ala. Feed: paraxylene, xylene. Products: paraxylene (454,000 mt/y), terephthalic acid (718,000 mt/y).

Joliet, Ill. Feed: butane, metaxylene, styrene. Products: isophthalic acid (77,000 mt/y), maleic anhydride (35,000 mt/y), polystyrene (88,200 mt/y).

Texas City, Tex. Feed: aromatics, benzene, butylenes, crude oil, ethylene, propylene, xylene. Products: benzene (410,000 mt/y), metaxylene, (102,000 mt/y), paraxylene (546,000 mt/y), polyisobutylene (99,000 mt/y), propylene (258,000 mt/y), solvents (162,000 mt/y), styrene (335,000 mt/y), toluene (810,000 mt/y), xylene mix (760,000 mt/y).

Torrance, Calif. Feed: styrene. Product: polystyrene (13,400 mt/y).

Whiting, Ind. Feed: butylenes, methanol. Product: MTBE (163,000 mt/y), polyisobutylene (75,000 mt/y), propylene (130,000 mt/y), xylene mix (560,000 mt/y).

Willow Springs, Ill. Feed: styrene. Products: polystyrene (34,400 mt/y).

AMOCO OIL CO.

Texas City, Tex. Feed: crude oil. Products: benzene (410,000 mt/y), toluene (810,000 mt/y), xylene mix (760,000 mt/y).

Whiting, Ind. Feed: crude oil. Products: propylene (130,000 mt/y), xylene mix (560,000 mt/y).

ARISTECH CHEMICAL CORP.

Florence, Kentucky. Product: acrylics (17,237 mt/y).

Haverhill, Ohio. Feed: ammonia, cumene. Products: acetone (172,367 mt/y), bisphenol A (87,091 mt/y), phenol (276,241 mt/y).

LaPorte, Tex. Feed: propylene. Product: polypropylene (158,760 mt/y).

Neal, West Va. Feed: propylene. Product: polypropylene (74,843 mt/y).

Neville Island, Pa. Feed: alcohols, dibasic acids. Products: maleic anhydride (19,051 mt/y), plasticizers (35,255 mt/y).

Neville Island, Pa., Jacksonville, Ark., Colton, Calif., Bartow, Fla. Feed: dibasic acids, alcohols, glycols, styrene. Product: polyester (122,471 mt/y).

ASHLAND CHEMICAL CO.

Catlettsburg, Ky. Feed: crude oil, coal tar light oil. Products: aromatics mix (10,900 mt/y), benzene (160,000 mt/y), cumene (190,000 mt/y), toluene (110,000 mt/y), xylene mix (90,000 mt/y).

Neal, W. Va. Feed: n-butane. Product: maleic anhydride (29,492 mt/y).

CARBON BLACK PLANTS:
Aransas Pass, Tex. 81,500 mt/y.
Belpre, Ohio 54,500 mt/y.
Ivanhoe, La. 129,000 mt/y.

ATLANTIC RICHFIELD CO.

Bayport, Tex. Feed: isobutane, propylene. Products: acetone (25,400 mt/y), propylene (107,800 mt/y), propylene glycol (507,240 mt/y).

Beaver Valley, Pa. Feed: styrene. Products: polystyrene (228,700 mt/y), styrene (101,000 mt/y).

Port Arthur, Tex. Feed: chlorine, ethylene. Products: ethylene dichloride (225,000 mt/y).

ATLAS POWDER CO.

(subsidiary of Tyler Corp.)

Joplin, Mo. Feed: natural gas. Products: ammonia (355 mt/d), urea (195 mt/d).

BASF CORP.

Chemicals Division.

Freeport, Tex. Products: acrylic-acrylates (237 mt/y), butanol-ethylhexanol (100 mt/y), caprolactam (159 mt/y).

Geismar, La. Products: ethylene glycol (177 mt/y), ethylene oxide (218 mt/y).

Lowland, Tenn. Product: nylons (227 mt/y).

South Brunswick, N.J. Product: expandable polystyrene (80 mt/y).

BISON NITROGEN PRODUCTS CO.

(65% Terra International, 35% W. R. Grace).

Woodward, Okla. Feed: ammonia, carbon dioxide. Product: urea (305 mt/d).

BORDEN CHEMICAL CO.

Chemical Division

Demopolis, Ala. Feed: methanol. Product: formaldehyde (30,657 mt/y).

Diboll, Tex. Feed: methanol. Product: formaldehyde (43,533 mt/y).

Fayetteville, N.C. Feed: methanol. Product: formaldehyde (184,000 mt/y).

Fremont, Calif. Feed: methanol. Product: formaldehyde (70,511 mt/y).

Kent, Wash. Feed: methanol. Product: formaldehyde (36,788 mt/y).

La Grande, Ore. Feed: methanol. Product: formaldehyde (28,817 mt/y).

Louisville, Ky. Feed: methanol. Product: formaldehyde (43,533 mt/y).

Missoula, Mont. Feed: methanol. Product: formaldehyde (45,598 mt/y).

Sheboygan, Wisc. Feed: methanol. Product: formaldehyde (70,511 mt/y).

Springfield, Ore. Feed: methanol. Product: formaldehyde (109,138 mt/y).

BORDEN CHEMICALS-PLASTICS OPERATING LTD. PARTNERSHIP

Geismar, La. Feed: methanol, natural gas. Products: acetic acid (63,500 mt/y), acetylene (46,200 mt/y), ammonia (360,000 mt/y), formaldehyde (202,000 mt/y), methanol (541,000 mt/y), polyvinyl chloride (159,000 mt/y), urea (218,000 mt/y), vinyl chloride (363,000 mt/y).

Illiopolis, Ill. Feed: vinyl chloride, vinyl acetate. Product: polyvinyl chloride (145,000 mt/y).

BORG-WARNER CHEMICALS

North American plants. Product: ABS (362,874 mt/y).

Carville, La. (with Cosden Oil & Chemical). Feed: benzene, ethylene. Products: styrene (340,195 mt/y), toluene (17,000 mt/y).

Geismar, La. (with Union Texas Petroleum and BASF). Feed: ethane, propane. Products: butadiene (2,722 mt/y), ethylene (54,431 mt/y), propylene (2,558 mt/y). Note: Borg-Warner share only.

BP CHEMICALS AMERICA

Green Lake, Tex. Feed: ammonia, propylene. Product: acrylonitrile (270,000 mt/y).

Lima, Ohio. Feed: ammonia, natural gas, propylene. Products: acrylonitrile (160,000 mt/y), ammonia (1,360 mt/d), urea (1,300 mt/d).

CABOT CORP.

Pampa, Tex.; Franklin and Ville Platte, La.; and Waverly, W. Va. Feed: gas and petroleum fractions. Product: carbon blacks (furnace process and thermal) (440,000 mt/y).

CAIN CHEMICAL INC.

Bayport, Tex. Feed: ethylene. Products: ethylene glycol (220,000 mt/y), ethylene oxide (235,000 mt/y), ethylene derivatives (70,000 mt/y).

Beaumont, Tex. Feed: ethylene. Products: ethylene glycol (290,000 mt/y), ethylene oxide (210,000 mt/y).

Chocolate Bayou, Tex. Feed: gas oil, drip oil, naphtha, NGL, toluene. Products: aromatics (340,000 mt/y), butadiene (60,000 mt/y), ethylene (485,000 mt/y), propylene (305,000 mt/y).

Corpus Christi, Tex. Feed: gas oil, LPG, naphtha, toluene. Products: aromatics (250,000 mt/y), butadiene (95,000 mt/y), ethylene (700,000 mt/y), propylene (275,000 mt/y).

Matagorda, Tex. Feed: ethylene. Product: hd polyethylene (200,000 mt/y).

Orange, Tex. Feed: ethylene. Product: hd polyethylene (95,000 mt/y).

Victoria, Tex. Feed: ethylene. Product: hd polyethylene (130,000 mt/y).

CAPE INDUSTRIES

(joint venture Hoechst-Celanese and American Petrofina).

Wilmington, N.C. Feed: methanol, paraxylene. Products: dimethyl terephthalate (640,000 mt/y), terephthalic acid (140,000 mt/y).

CELANESE CHEMICAL CO.

(subsidiary of Hoechst Celanese Corp.)

Bay City, Tex. Feed: ethylene, propylene. Product: butanol (113,000 mt/y), butaraldehyde (113,000 mt/y), vinyl acetate (216,000 mt/y).

Bishop, Tex. Feed: natural gas. Products: formaldehyde (818,000 mt/y), methanol (393,000 mt/y).

Clear Lake, Tex. Feed: natural gas, ethylene. Products: acetic acid (409,000 mt/y), acrylic acid-esters (136,000 mt/y), ethylene glycol (227,000), ethylene oxide (205,000 mt/y), vinyl acetate (200,000 mt/y).

Newark, N.J. Feed: methanol. Product: formaldehyde (55,000 mt/y).

Pampa, Tex. Feed: butane. Product: acetic acid (250,000 mt/y), acetic anhydride.

Rock Hill, S.C. Feed: methanol. Product: formaldehyde (55,000 mt/y).

CERTAINTEED CORP.

Lake Charles, La. Feed: vinyl chloride monomer. Product: polyvinyl chloride (105,000 mt/y).

CF INDUSTRIES INC.

Donaldsonville, La. Feed: natural gas. Products: ammonia (1,930,000 mt/y), urea (1,199,000 mt/y).

Terre Haute, Ind. Feed: natural gas. Product: ammonia (130,000 mt/y).

CHAMPLIN REFINING CO.

Corpus Christi, Tex. Feed: refinery products. Products: benzene (62,000 mt/y), cumene (250,000 mt/y), cyclohexane (106,000 mt/y), toluene (110,000 mt/y), xylene mix (15,000 mt/y).

CHEMBOND CORP.

(100% Priha Inc.)

Andalusia, Ala. Feed: methanol. Product: formaldehyde (45,000 mt/y).

Moncure, N.C. Feed: methanol. Product: formaldehyde (55,000 mt/y).

Springfield, Ore. Feed: methanol. Product: formaldehyde (73,000 mt/y).

Winnfield, La. Feed: methanol. Product: formaldehyde (45,000 mt/y).

CHEVRON CHEMICAL CO.

(subsidiary of Standard Oil Co. of California)

Baytown, Tex. Feed: ethylene. Products: alphaolefins (113,600 mt/y), ethylene (544,300 mt/y), butadiene (190,000 mt/y), ld polyethylene (272,000 mt/y), propylene (295,000 mt/y).

Finley, Wash. Feed: natural gas. Product: ammonia (125,000 mt/y).

Marietta, Ohio. Feed: styrene. Product: polystyrene (217,000 mt/y).

Orange, Tex. Feed: ethylene. Product: ld polyethylene (136,000 mt/y). hd polyethylene (261,700 mt/y).

Pascagoula, Miss. Feed: petroleum base stocks. Product. paraxylene (227,000 mt/y).

Philadelphia, Pa. Feed: petroleum base stocks. Products: benzene (127,000 mt/y), cumene (204,000 mt/y), toluene (102,000 mt/y).

Port Arthur, Tex. Feed: petroleum base stocks. Products: benzene (360,000 mt/y), butadiene (22,000 mt/y), cumene (204,000 mt/y), cyclohexane (112,000 mt/y), ethylene (385,000 mt/y), propylene (204,000 mt/y), toluene (132,000 mt/y).

St. Helens, Ore. Feed: natural gas. Products: ammonia (250 t/d), urea (350 t/d).

St. James, La. Feed: ethylene. Product: styrene (283,000 mt/y).

CITGO PETROLEUM CORP.

Lake Charles, La. Feed: crude. Products: propylene (119,400 mt/y).

COASTAL EAGLE POINT OIL CO.

Westville, N.J. Feed: crude oil. Product: cumene (94,000 mt/y).

COLUMBIA NITROGEN CORP.

(NV DSM subsidiary).

Augusta, Ga. Feed: natural gas. Products: ammonia (500,000 mt/y), urea (360,000 mt/y).

COLUMBIAN CHEMICALS CO.

El Dorado, Ark., Franklin, La., Mojave, Calif., Moundsville, W. Va., Ulysses, Kans. Feed: heavy aromatic hydrocarbons. Product: carbon black (293,000 mt/y).

COMINCO AMERICAN INC.

Borger, Tex. Feed: natural gas. Products: ammonia (325,000 mt/y), urea (70,000 mt/y).

CONCARB DIVISION, WITCO CORP.

Phenix City, Ala. Feed: heavy aromatic oil. Product: carbon black (25,000 mt/y).

Ponca City, Okla. Feed: heavy aromatic oil. Product: carbon black (61,500 mt/y).

Sunray, Tex. Feed: heavy aromatic oil. Product: carbon black (45,500 mt/y).

COPOLYMER RUBBER & CHEMICAL CORP.

Addis, La. Feed: petroleum derivative. Product: ethylene-propylene rubber (40,000 mt/y).

Baton Rouge, La. Feed: petroleum derivatives. Products: styrene-butadiene rubber (190,000 mt/y).

CROWN CENTRAL PETROLEUM CORP.

Pasadena, Tex. Feed: crude oil. Products: benzene (70,000 mt/y), propylene (33,000 mt/y), toluene (35,000 mt/y), xylene (35,000 mt/y).

DIAMOND SHAMROCK REFINING & MARKETING CO.

Sunray, Tex. Feed: natural gas. Product: ammonia (400 mt/d).

DIVERSITECH GENERAL

(A GenCorp Co.)

Mogadore, Ohio. Feed: butadiene, styrene, vinyl pyridine. Product: SB-latices (93,000 mt/y).

DIXIE CHEMICAL CO.

Bayport, Tex. Product: acrylics (4,500 mt/y).

DOW CHEMICAL

Freeport, Tex. Products: acetylene (4,000 mt/y), acrylonitrile-butadiene-styrene (136,000 mt/y), ammonia (47,000 mt/y). benzene (535,000 mt/y), bisphenol A (77,000 mt/y), ethylbenzene (795,000 mt/y), ethylene (1,820,000 mt/y), ethyl chloride (35,000 mt/y), ethylene dichloride (727,000 mt/y), ethylene glycol (115,000 mt/y), ethylene oxide (130,000 mt/y), phenol (211,000 mt/y), hd polyethylene (75,000 mt/y), ld polyethylene (400,000 mt/y), propylene (250,000 mt/y), propylene glycol (114,000 mt/y), propylene oxide (435,000 mt/y), styrene (590,000 mt/y).

Ironton, Ohio. Products: acrylonitrile (29,000 mt/y), polystyrene.

Oyster Creek (Freeport), Tex. Products: acetone (127,000 mt/y), ethylene dichloride (500,000 mt/y), vinyl chloride (350,000 mt/y).

Plaquemine, La. Products: ethylene (682,000 mt/y), ethylene dichloride (900,000 mt/y), ethylene glycol (204,000 mt/y), ethylene oxide (206,000 mt/y), hd polyethylene (120,000 mt/y), ld polyethylene (350,000 mt/y), propylene (75,000 mt/y), propylene glycol (68,000 mt/y), propylene oxide (200,000 mt/y), plasticizers (54,000 mt/y).

Torrance, Calif. Products: acrylonitrile (34,000 mt/y), polystyrene (453,000 mt/y).

EL PASO PRODUCTS CO.

Bayport, Tex. Feed: ethylene, propylene. Product: ld polyethylene (110,000 mt/y), polypropylene (140,000 mt/y).

Odessa, Tex. Feed: benzene, ethane, propane. Products: ethylene (230,000 mt/y), polyethylene (186,000 mt/y), polypropylene (100,000 mt/y), propylene (100,000 mt/y), styrene (140,000 mt/y).

ETHYL CORP.

Orangeburg, S.C. Feed: ethylene. Product: alkylbenzene.

Pasadena, Tex. Feed: ethylene. Product: alphaolefins, ethylchloride, ethylene dichloride.

EXXON CHEMICAL AMERICAS

Baton Rouge, La. Feed: petroleum intermediates. Products: benzene, butadiene, butylenes, carbon black feedstocks, ethylene, ethylene vinyl acetate copolymers, heart cut distillates, higher olefins, isoparaffins, isoprene, isopropanol, oxoalcohols, phthalic anhydride, ld polyethylene, propylene, vinyl acetate, plasticizers, resins, butyl rubber, chlorobutyl, ep rubber, solvents.

Baytown, Tex. Feed: petroleum intermediates. Products: benzene, butadiene, butene 1, ethylene, isoamylene, isobutylene, MTBE, orthoxylene, paraffins, paraxylene, polybutene polymers, polypropylene, polyisobutylene, propylene, butyl rubber.

Bayway, N.J. Feed: petroleum intermediates. Products: polyisobutylene, propylene, solvents.

Mont Belvieu, Tex. Products: linear ld polyethylene, hd polyethylene.

FARMLAND INDUSTRIES INC.

Dodge City, Kan. Feed: natural gas. Product: ammonia (590 mt/d).

Enid, Okla. Feed: natural gas. Product: ammonia (2,280 mt/d), urea (900 mt/d).

Fort Dodge, Iowa. Feed: natural gas. Product: ammonia (570 mt/d).

Lawrence, Kan. Feed: natural gas. Products: ammonia (1,040 mt/d), urea (680 mt/d).

Pollock, La. Feed: natural gas. Product: ammonia (1,140 mt/d).

FINA OIL & CHEMICAL CO.

Big Spring, Tex. Feed: crude oil. Product: propylene (34,400 mt/y).

Calumet City, Ill. Feed: styrene. Product: polystyrene (83,800 mt/y).

Carville, La. Feed: benzene, ethylene. Products: polystyrene (68,000 mt/y), styrene (340,300 mt/y).

Groves, Tex. Feed: L[illegible]G. Product: propylene (55,000 mt/y)..

LaPorte, Tex. Feed: ethylene, propylene. Product: polypropylene (272,158 mt/y).

Port Arthur, Tex. Feed: crude oil. Products: benzene (171,000 mt/y), xylene mix (295,000 mt/y).

Windsor, N.J. Feed: styrene. Product: polystyrene (61,250 mt/y).

FIRESTONE SYNTHETIC RUBBER & LATEX CO.

Lake Charles, La. Feed: butadiene, styrene. Product: SBR (120,000 mt/y).

Orange, Tex. Feed: butadiene. Products: polybutadiene (110,000 mt/y).

GENERAL TIRE INC.

(A GenCorp Co.)

Odessa, Tex. Feed: butadiene, styrene. Product: SBR (99,793 mt/y).

GEORGIA GULF CORP.

Bound Brook, N.J. Feed: cumene. Products: acetone (42,700 mt/y), phenol (71,200 mt/y).

Delaware City, Del. Feed: vinyl chloride. Products: polyvinyl chloride (68,000 mt/y).

Houston, Tex. Feed: benzene, propylene. Product: cumene (430,900 mt/y).

Plaquemine, La. Feed: chlorine, cumene, ethylene, hydrogen, natural gas, vcm. Products: acetone (106,100 mt/y), ammonia (190,500 mt/y), methanol (378,400 mt/y), phenol (176,900 mt/y), polyvinyl chloride (317,500 mt/y), vinyl chloride (499,000 mt/y).

GEORGIA-PACIFIC CORP.

Albany, Oregon. Feed: methanol. Product: formaldehyde (77,111 mt/y).

Bellingham, Wash. Feed: pulp mill liquor. Product: ethanol (17,935 mt/y).

Columbus, Ohio. Feed: methanol. Product: formaldehyde (74,843 mt/y).

Conway, N.C. Feed: methanol. Product: formaldehyde (47,628 mt/y).

Crossett, Ark. Feed: methanol. Product: formaldehyde (74,843 mt/y).

Lufkin, Tex. Feed: methanol. Product: formaldehyde (47,628 mt/y).

Russellville, S.C. Feed: methanol. Product: (99,791 mt/y formaldehyde).

Taylorsville, Miss. Feed: methanol. Product: formaldehyde (72,575 mt/y).

Vienna, Ga. Feed: methanol. Product: formaldehyde (47,628 mt/y).

BFGOODRICH CO. GEON VINYL DIVISION

Avon Lake, Ohio, Calvert City and Louisville, Ky., Deer Park and LaPorte, Tex., Henry, Ill., Long Beach, Calif., Pedricktown, N.J., Plaquemine, La., Terre Haute, Ind. Products: vinyl chloride monomer and vinyl resins.

GOODYEAR TIRE & RUBBER CO.

Beaumont, Tex. Feed: C-5 streams, butadiene. Products: isoprene (81,600 mt/y), polyisoprene (60,000 mt/y), polybutadiene (182,000 mt/y).

Calhoun, Ga. Feed: butadiene, styrene. Product: SBR (41,000 mt/y).

Houston, Tex. Feed: acrylonitrile, butadiene-styrene. Products: acrylonitrile-butadiene rubber (14,000 mt/y), styrene-butadiene rubber (310,000 mt/y).

Niagara Falls, N.Y. Feed: vinyl chloride monomer. Product: polyvinyl chloride (54,000 mt/y).

Point Pleasant, W. Va. Feed: tpa, ethylene glycol. Product: polyester (154,000 mt/y).

W.R. GRACE & CO.

Memphis, Tenn. Feed: natural gas. Products: ammonia (308,400 mt/y), urea (349,300 mt/y).

GREEN VALLEY CHEMICAL CORP.

Creston, Iowa. Feed: natural gas. Product: ammonia (100 mt/d).

HAWKEYE CHEMICAL CO.

Clinton, Iowa. Feed: natural gas and hydrogen. Products: ammonia (200,000 mt/y), urea (60,000 mt/y).

HERCULES INC.

Louisiana, Mo. Feed: natural gas. Product: formaldehyde (60,000 mt/y).

HILL PETROLEUM CO.

Houston, Tex. Feed: crude and intermediate feedstocks. Products: benzene (22,127 mt/y), normal paraffins (61,250 mt/y), toluene (51,058 mt/y), xylene mix (48,059 mt/y).

HIMONT USA INC.

Bayport, Tex. Feed: propylene. Product: polypropylene (380,000 mt/y).

Lake Charles, La. Feed: propylene. Product: polypropylene (380,000 mt/y).

J.M. HUBER CORP.

Baytown, Tex. Feed: refinery bottoms. Product: carbon black (318 mt/d).

Borger, Tex. Feed: refinery bottoms. Product: carbon black (235 mt/d).

Orange, Tex. Feed: refinery bottoms. Product: carbon black (167 mt/d).

HÜLS AMERICA INC.

Chestertown, Md. Feed: alcohols, phthalic anhydride. Product: plasticizers (36,000 mt/y).

IMC FERTILIZER INC.

Sterlington, La. Feed: natural gas. Product: ammonia (900,000 mt/y).

KOPPERS CI

Bridgeville, Pa. Product: polyester.

Chicago, Ill. Feed: naphthalene, orthoxylene. Products: phthalic anhydride (57,000 mt/y), polyester.

Follansbee, W. Va. Feed: coal tar. Product: naphthalene (70,000 mt/y).

Oxnard, Calif. Product: polyester.

Richmond, Calif. Product: polyester.

LaROCHE INDUSTRIES INC.

Cherokee, Alabama. Feed: natural gas. Product: ammonia (175,000 mt/y).

LYONDELL PETROCHEMICAL CO.

(wholly owned by Atlantic Richfield Co.)

Channelview, Tex. Feed: ethane, gas oils, naphthas, mixed C_4's, natural gas, propane. Products: butadiene (200,000 mt/y), butylenes (170,000 mt/y), ethylbenzene (612,250 mt/y), ethylene (1,270,000 mt/y), isoprene (45,000 mt/y), isopropanol (25,900 mt/y), methanol (600,000 mt/y), polybutadiene (8,150 mt/y), propylene (725,000 mt/y), propylene oxide (235,500 mt/y), styrene (542,200 mt/y).

Houston, Tex. Feed: refinery feeds. Products: benzene (170,000 mt/y), orthoxylene (110,000 mt/y), paraxylene (175,000), toluene (100,000 mt/y).

MARATHON OIL CO.

Detroit, Mich. Feed: refinery. Product: propylene (58,000 mt/y).

Garyville, La. Feed: refinery gas. Product: propylene (50,000 mt/y).

Texas City, Tex. Feed: refinery. Products: benzene (20,000 mt/y), propylene (60,800 mt/y), toluene (75,000 mt/y), xylene mix (48,400 mt/y).

MELAMINE CHEMICALS INC.

Donaldsonville, La. Feed: urea. Product: melamine (32,000 mt/y).

MISSISSIPPI CHEMICAL CORP.

Yazoo City, Miss. Feed: natural gas. Product: ammonia (1,020 mt/d), urea (465 mt/d).

MOBIL CHEMICAL CO.

(division of Mobil Oil Corp.)

Beaumont, Tex. Feed: natural gas liquids, reformate. Products: benzene (300,000 mt/y), butadiene (27,000 mt/y), butylenes (14,000 mt/y), ethylene (499,000 mt/y), ld polyethylene (443,000 mt/y), propylene (136,000 mt/y), toluene (148,000 mt/y).

Houston, Tex. Feed: natural gas liquids. Products: ethylene (227,000 mt/y), propylene (82,000 mt/y).

Holyoke, Mass. Feed: styrene. Products: polystyrene (36,000 mt/y).

Joliet, Ill. Feed: styrene. Product: polystyrene (166,000 mt/y).

Santa Ana, Calif. Feed: styrene. Product: polystyrene (27,000 mt/y).

MONSANTO

Addyston, Ohio; Muscatine, Iowa. Product: ABS (259,000 mt/y).

Alvin, Tex. Feed: propylene. Product: acrylonitrile (210,000 mt/y).

Luling, La. Feed: natural gas. Product: ammonia (210,000 mt/y).

Pensacola, Fla. Feed: butane. Product: maleic anhydride (58,968 mt/y).

NIPRO INC.

(NV DSM subsidiary)

Augusta, Ga. Feed: cyclohexane. Product: caprolactam (165,000 mt/y).

N-REN CORP.

Carlsbad, N.M. Feed: natural gas. Product: ammonia (70,000 mt/y).

East Dubuque, Ill. Feed: natural gas. Products: ammonia (250,000 mt/y).

Pine Bend, Minn. Feed: natural gas. Product: ammonia (27,000 mt/y).

Pryor, Okla. Feed: natural gas. Products: ammonia (75,000 mt/y).

OCCIDENTAL CHEMICAL CO.

Addis, La. Feed: vinyl chloride. Product: polyvinyl chloride (181,000 mt/y).

Burlington, N.J. Feed: vinyl chloride. Product: polyvinyl chloride (54,000 mt/y).

Deer Park, Tex. Feed: ehtylene, chlorine. Products: ethylene dichloride (74,000 mt/y), vinyl chloride (431,000 mt/y).

Lake Charles, La. Feed: ethane, propane. Products: ethylene (227,000 mt/y), propylene (82,000 mt/y).

Pasadena, Tex. Feed: vinyl chloride. Product: polyvinyl chloride (408,000 mt/y).

Pottstown, Pa. Feed: vinyl chloride. Product: polyvinyl chloride (100,000 mt/y).

Tacoma, Wash. Feed: hydrogen, nitrogen. Product: ammonia (30,000 mt/y).

OKLAHOMA NITROGEN CO.

(62.5% W.R. Grace, 37.5% Terra International)

Woodward, Okla. Feed: natural gas. Product: ammonia (408,200 mt/y).

OLIN CORP.

Lake Charles, La. Feed: natural gas. Products: ammonia (480,000 mt/y), urea (214,000 mt/y).

PHILLIPS 66 CO.

Pasadena, Tex. Feed: butadiene, ethylene, propylene, styrene. Products: hd polyethylene (626,000 mt/y), polypropylene (190,000 mt/y), resins (68,000 mt/y).

Sweeny, Tex. Feed: benzene, crude oil, natural gas liquids. Products: aromatics mix (275,000 mt/y), cyclohexane (263,000 mt/y), ethylene (1,043,000 mt/y), propylene (85,000 mt/y).

POLYSAR INC.

Copley, Ohio. Feed: styrene. Product: polystyrene (63,000 mt/y).

Decatur, Ala. Feed: styrene. Product: polystyrene.

Leominster, Mass. Feed: styrene. Product: polystyrene (82,000 mt/y).

Orange, Tex. Feed: butadiene, ethylene, propylene. Products: butadiene rubber (88,000 mt/y), edpm (35,000 mt/y).

Springfield, Mass. Feed: styrene. Product: polystyrene.

PPG INDUSTRIES INC.

Lake Charles, La. Feed: ethylene. Products: ethylchloride (68,000 mt/y), ethylene dichloride (320,000 mt/y), vinyl chloride (227,000 mt/y).

QUANTUM CHEMICAL CORP.- USI Division

Clinton, Iowa. Feed: ethane-propane mix. Products: butadiene (17,000 mt/y), ethylene (365,000 mt/y), ld polyethylene (195,500 mt/y), hd polyethylene (159,000 mt/y), propylene (14,000 mt/y).

Chocolate Bayou, Tex. Product: hd polyethylene (181,800 mt/y).

Deer Park, Texas. Feed: carbon monoxide, ethylene, methanol. Products: acetic acid (363,600 mt/y), ld polyethylene (207,000 mt/y), hd polyethylene (250,000 mt/y), vinyl acetate (272,200 mt/y).

Houston, Texas. Feed: ethylene. Product: polyvinyl alcohol (10,000 mt/y).

Morris, Ill. Feed: butane, ethane, propane. Products: butadiene (110,000 mt/y), ethylene (455,000 mt/y), ethylene glycol (96,500 mt/y), ethylene oxide (41,000 mt/y), ld polyethylene (245,500 mt/y), lld polyethylene (113,600 mt/y), polypropylene (120,400 mt/y), propylene (110,000 mt/y).

Port Arthur, Texas. Feed: ethylene. Products: lld polyethylene (136,400 mt/y), ld polyethylene (86,000 mt/y), hd polyethylene (154,500 mt/y).

Tuscola, Illinois. Feed: ethylene. Products: ethanol (198,000 mt/y), ethylene (182,000 mt/y), ld polyethylene (77,000 mt/y).

REICHHOLD CHEMICAL INC.

Hampton, S.C. Feed: methanol. Product: formaldehyde.

Houston, Tex. Feed: methanol. Product: formaldehyde.

Kansas City, Kans. Product: formaldehyde.

Tacoma, Wash. Product: formaldehyde.

ROHM AND HAAS CO.

Bayport, Tex; Bristol and Croydon, Pa; Calumet City, Ill; Fayetteville, N.C.; Hayward, Calif; Louisville, Ky. Products: acrylics, acrylic esters, plasticizers, polyester, polyethylene, specialty acrylic monomers and polymers.

Deer Park, Texas. Feed: natural gas, propylene. Products: acrylic acid and esters (260,000 mt/y).

RUBICON INC.

Geismar, La. Feed: benzene. Product: aniline (136,000 mt/y).

SHELL CHEMICAL CO.

Deer Park, Tex. Feed: natural gas liquids, petroleum fractions. Products: acetone (210,000 mt/y), benzene (500,000 mt/y), bisphenol A (158,000 mt/y), butadiene (113,000 mt/y), ethylene (812,000 mt/y), isoprene concentrate (49,000 mt/y), isopropanol (225,000 mt/y), normal paraffins (99,000 mt/y), phenol (272,000 mt/y), propylene (485,000 mt/y), resins (90,000 mt/y), toluene (167,000 mt/y), xylene mix (181,000 mt/y).

Geismar, La. Feed: ethylene. Products: linear C_4+olefins (317,000 mt/y), ethylene glycol (226,000 mt/y), ethylene oxide (362,000 mt/y), glycol ethers (29,000 mt/y).

Marietta, Ohio. Product: thermoplastic rubber (170,000 mt/y).

Norco, La. Feed: natural gas liquids, petroleum fractions. Products: butadiene (226,000 mt/y), ethylene (1,016,000 mt/y), polypropylene (136,000 mt/y), propylene (635,000 mt/y).

Odessa, Tex. Product: benzene (15,000 mt/y).

Taft, La. Product: polybutylene (27,000 mt/y).

Wood River, Ill. Product: benzene (149,000 mt/y).

SHELL CHEMICAL CO. and UNION CARBIDE CORP.

(Joint ownership)

Seadrift, Tex. Product: polypropylene (90,000 mt/y).

SHINTECH INC.

Freeport, Tex. Feed: vinyl chloride monomer. Product: polyvinyl chloride (460,000 mt/y).

SID RICHARDSON CARBON CO.

Addis, La. Feed: heavy oil and natural gas. Product: carbon black (61,000 mt/y).

Big Spring, Tex. Feed: heavy oil. Product: carbon black (53,000 mt/y).

Borger, Tex. Feed: heavy oil. Product: carbon black (97,000 mt/y).

SIMPLOT & CO., J.R.

Pocatello, Idaho. Feed: natural gas. Product: ammonia (275 mt/d)

SOHIO Oil Co.

Belle Chasse, La. Feed: reformate, toluene. Products: benzene (217,000 mt/y), xylene mix (200,000 mt/y).

Lima, Ohio. Feed: refinery gases, reformate, toluene. Products: benzene (330,000 mt/y), propylene (157,000 mt/y).

SOLTEX POLYMER CORP.
(subsidiary of Solvay & Cie.)

Deer Park, Tex. Feed: ethylene, propylene, Product: hd polyethylene, polypropylene.

STEPAN CHEMICAL CO.

Joliet, Ill. Feed: orthoxylene. Product: phthalic anhydride (77,000 mt/y).

SUN REFINING & MARKETING CO.

Marcus Hook, Pa. Feed: crude, purchased gas oil and naphtha. Products: benzene (100,000 mt/y), ethylene (86,000 mt/y), ethylene oxide (44,000 mt/y), propylene (200,000 mt/y), toluene (75,000 mt/y), xylene mix (100,000 mt/y).

Toledo, Ohio. Feed: crude. Products: benzene (60,000 mt/y), toluene (200,000 mt/y), xylene mix (200,000 mt/y).

Tulsa, Okla. Feed: crude. Products: benzene (5,000 mt/y), cyclohexane (100,000 mt/y), toluene (10,000 mt/y).

SUNOLIN CHEMICAL CO.

Claymont, Del. Feed: refinery dry gas, oxygen. Products: ethylene (106,863 mt/y), ethylene oxide (45,352 mt/y).

TENNECO OIL CO.

Chalmette, La. Feed: reformate. Products: benzene (69,100 mt/y), orthoxylene (61,500 mt/y), paraxylene (67,700 mt/y), toluene (126,200 mt/y), xylene mix (13,900 mt/y), solvents (53,200 mt/y).

TENNESSEE VALLEY AUTHORITY

Muscle Shoals, Ala. Feed: natural gas. Products: ammonia (248 mt/d).

TENN-USS CHEMICALS CO.
(Joint ownership Tenneco and USX)

Pasadena, Tex. Feed: 2 ethyl hexanol, orthoxylene, phthalic anhydride, propylene. Product: normal paraffins (86,365 mt/y), phthalic anhydride (95,255 mt/y).

TERRA INTERNATIONAL INC.

Sioux City (Port Neal), Iowa. Feed: natural gas. Products: ammonia (700 mt/d), urea (650 mt/d).

TEXACO CHEMICAL CO.

Delaware City, Del. Feed: petroleum fractions. Products: benzene (73,000 mt/y), naphthalene (35,000 mt/y), toluene (55,000 mt/y).

El Dorado, Kans. Feed: petroleum fractions. Products: acetone (25,000 mt/y), benzene (56,000 mt/y), cumene (64,000 mt/y), phenol (43,000 mt/y), toluene (60,000 mt/y).

Port Arthur, Tex. Feed: gas oil, NGL, naphtha, naphtha fractions. Products: aromatics (250,000 mt/y), benzene (165,000 mt/y), butadiene (51,000 mt/y), cyclohexane (200,000 mt/y), ethylene (475,000 mt/y), propylene (238,000 mt/y).

Port Neches, Tex. Products: butadiene (225,000 mt/y), ethylene glycol (235,000 mt/y), ethylene oxide (315,000 mt/y).

TEXAS CITY REFINING INC.

Texas City, Tex. Feed: refinery streams. Products: propylene (73,000 mt/y).

TEXAS EASTMAN CO.

Harrison County, Tex. Feed: ethane, propane. Products: acetaldehyde (242,000 mt/y), aromatics mix (67,000 mt/y), butanol (100,000 mt/y), butylenes-butadiene mix (50,000 mt/y), butyraldehyde (370,000 mt/y), ethanol (89,000 mt/y), ethylene (650,000 mt/y), ethylene glycol (110,000 mt/y), ethylene oxide (100,000 mt/y), oxoalcohols (250,000 mt/y), ld polyethylene (300,000 mt/y), polypropylene (70,000 mt/y), propylene (300,000 mt/y), solvents (200,000 mt/y).

TEXAS PETROCHEMICALS CORP.
(subsidiary of Texas Olefins Co.)

Houston, Tex. Feed: mixed C_4 olefins, diolefins, isobutane, methanol. Products: butadiene (350,000 mt/y), butene 1 (90,000 mt/y), diisobutylene (30,000 mt/y), isobutylene (25,000 mt/y), MTBE (470,000 mt/y).

TRIAD CHEMICAL CO.
(joint venture Mississippi Chemical and First Mississippi Corp.)

Donaldsonville, La. Feed: natural gas. Products: ammonia (1,100 mt/y), urea (1,350 mt/y).

UNION CARBIDE CORP.

Bound Brook, N.J. Feed: cumene, petroleum derived feedstocks, derivatives. Products: acetone (50,000 mt/y), formaldehyde (45,000 mt/y), phenol (80,000 mt/y), polystyrene.

Seadrift, Tex. Feed: ethane, propane. Products: acetylene (9,000 mt/y), butadiene, ethylbenzene (170,000 mt/y), ethylene (562,300 mt/y), ethylene glycol, ethylene oxide, oxoalcohols, ld polyethlene (362,874 mt/y), ld polyethylene (225,000 mt/y), lld polyethylene (308,000 mt/y), propylene, styrene (136,000 mt/y), solvents.

Taft, La. Feed: ethane, propane, butane, paraffinate, naphtha. Products: acetic acid, acetylene (5,000 mt/y), acrylic acid and acrylic esters (90,000 mt/y), benzene (230 mt/y), butadiene, ethylene (498,900 mt/y), ethylene dichloride (70,000 mt/y), ethylene glycol, ethylene oxide, lld-hdpolyethylene (327,273 mt/y), propylene.

Texas City, Tex. and Ponce, Puerto Rico. Feed: butadiene, ethylene, propylene. Products: acetylene (63,000 mt/y), butanol (168,000 mt/y), butyraldehyde (195,000 mt/y), ethanol (339,000 mt/y), ethylene—Ponce (412,700 mt/y), ethylene—Texas City (702,300 mt/y), isopropanol (349,000 mt/y).

UNOCAL CHEMICALS DIVISION

Beaumont, Tex. Feed: reformate. Products: benzene (51,100 mt/y), cyclohexane (50,000 mt/y), toluene (95,800 mt/y), xylene mix (105,900 mt/y).

Brea, Calif. Feed: natural gas. Products: ammonia (227,000 mt/y), urea (109,000 mt/y).

Bridgeview and Lemont, Ill. Product: polymers (62,900 mt/y).

Charlotte, N.C. Product: polymers (133,000 mt/y).

Kenai, Alaska. Feed: natural gas. Products: ammonia (1,034,000 mt/y), urea (907,000 mt/y).

La Mirada and Newark, Calif. Products: polymers (73,200 mt/y).

Lemont, Ill. Feed: reformate, primary light oil. Products: benzene (92,000 mt/y), toluene (50,400 mt/y), xylene mix (35,300 mt/y).

UNIROYAL CHEMICAL CO.

Geismar, La. Feed: ethylene, propylene. Product: ethylene-propylene rubber (44,000 mt/y).

VISTA CHEMICAL CO.

Aberdeen, Miss. and Oklahoma City, Okla. Feed: vinyl chloride monomer. Product: polyvinyl chloride (363,000 mt/y).

Baltimore, Md. Feed: benzene, n-paraffins. Products: alkylbenzene (104,000 mt/y).

West Lake, La. Feed: benzene, ethane, kerosine. Products: alkylbenzene (66,000 mt/y), aromatics (7,800 mt/y), butadiene (14,300 mt/y), ethylene (301,000 mt/y), n-paraffins (150,000 mt/y), propylene (7,900 mt/y), vinyl chloride (340,000 mt/y).

VULCAN MATERIALS CO.

Geismar, La. Feed: ethylene. Product: ethylene dichloride (100,000 mt/y).

URUGUAY

ITALCOLOR SA

San José. Feed: methanol. Products: formaldehyde (7,200 mt/y).

VENEZUELA

ESTIZULIA—Estireno del Zulia
(37.5% Pequiven, 37.5% Grupo Zuliano CA, 25% Dow Chemical)

Zuliz-El Tablazo Complex. Feed: styrene. Products: polystyrene (40,000 mt/y).

INTEQUIM—Quimica Integrada

Valencia. Products: acrylics (7,800 mt/y), alkyds (8,000 mt/y), formaldehyde (7,400 mt/y), polyester (5,600 mt/y).

NEGROVEN

Valencia. Feed: aromatic oil. Product: carbon black (40,000 mt/y).

NITROVEN—Venezolana del Nitrogeno
(Pequiven, Instituto Fomento Industrial, International Development & Investment CL)

Zulia-El Tablazo Complex. Feed: natural gas. Products: ammonia (594,000 mt/y-two units), urea (792,000 mt/y-two units).

OXIDOR—Oxidaciones Orgánicas
(59.44% Corimon, 29.13% Corpoquim, 11.3% Pequiven)

Valencia, Edo. Carabobo. Feed: orthoxylene. Product: phthalic anhydride (18,000 mt/y).

PEQUIVEN—Petroquimica de Venezuela.

Morón, Edo Carabobo. Feed: natural gas. Products: ammonia (198,000 mt/y), urea (248,000 mt/y).

Zulia-El Tablazo Complex. Feed: ethane, natural gas, propane. Products: ethylene (150,000 mt/y), propylene (35,000 mt/y).

PETROPLAS—Plásticos Petroquímica
(100% Pequiven)

Zulia-El Tablazo. Feed: chlorine, ethylene. Products: ethylene dichloride (72,000 mt/y), polyvinyl chloride (40,000 mt/y), vinyl chloride (44,000 mt/y).

PLASTILAGO—Plásticos del Lago
(49% Pequiven, 31.45% Grupo Zuliano CA, 15% CdF Chimie, 4.55% Mitsui Petrochemical)

Zulia-El Tablazo. Feed: ethylene. Product: hd polyethylene (60,000 mt/y).

POLILAGO—Polimeros del Lago.
(40% Pequiven, 30% Grupo Zuliano CA, 30% CdF Chimie)

Zulia-El Tablazo Complex. Feed: ethylene. Product: ld polyethylene (60,000 mt/y).

QUÍMICA VENOCO
(64.72% Industrias Venoco, 17.64% Pequiven, 17.64% Quimica de Venezuela)

Guacara, Edo. Carabobo. Feed: benzene, propylene. Products: alkylbenzene (56,000 mt/y).

VIRGIN ISLANDS

ST CROIX PETROCHEMICAL CORP.
(joint venture Amerada Hess Corp. and Hercofina)

St. Croix. Feed: mixed xylenes. Product: paraxylene (275,000 mt/y).

YUGOSLAVIA

DOW CHEMICAL CO.

Zagreb. Product: polystyrene.

Petrochemicals—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

***ARCO CHEMICAL CO. Channelview, Tex.** 73 MMlb/y 1,4-butanediol unit in engineering stage. Eng: Badger. Tech: Arco and Kuraray. Completion: end 1989.

Los Angeles, Calif. 2,400 b/d MTBE unit under construction. Eng: Fluor Daniel. Completion: 1990.

ADVANCED POLYPRO RESINS INC. Marysville, Mich. 40,000 t/y polypropylene under construction. Contractor: MES. Completion: 1988.

CAROLINA EASTMAN. Columbia, SC. 300 t/d polyethylene terephthalate expansion under construction. $80 MM. Eng: Bechtel. Contractor: Becon. Completion: Nov. 1988.

***CERTAINTEED CORP. Lake Charles, La.** 35 MM lb polyvinyl chloride expansion under construction. Feed: vinyl chloride. Contractor: Jacobs. Completion: mid 1989.

CHEVRON CHEMICAL. Baytown, Tex. 91,000 mt/y alphaolefins unit. Feed: ethylene. Contractor: Bechtel. Completion: 1990.

***CONOCO INC. Lake Charles, La.** 1,900 b/d MTBE unit. Completion: 1990.

EL PASO PRODUCTS. Bayport, Tex. 140,000 mt/y polypropylene unit planned. Feed: propylene. Completion: 1990.

***EMERY CHEMICAL. Cincinnati, Ohio.** Solvents plant under construction. $2 MM. Eng: Badger. Manage: Zachry. Completion: Dec. 1988.

EXXON CHEMICAL AMERICAS. Baytown, Tex. Polypropylene unit under construction. Eng: SIP. Contractor: Zachry.$20 MM. Completion: Dec. 1988.

FINA OIL & CHEMICAL. LaPorte, Tex. 113,400 mt/y polypropylene expansion. Feed: ethylene-propylene. Contractor: Fluor Daniel. Completion: end 1988.

GOODYEAR TIRE & RUBBER. West Point, Va. 58,000 mt/y polyethylene terephthalate unit under construction. $50 MM. Contractor: John Brown. Completion: early 1989.

***HUBINGER** (HJ Heinz Co.). **Keokuk, Iowa.** 11 MM gal/y ethanol unit. $14.9 MM. Completion: early 1989.

MELAMINE CORP. Donaldsonville, La. 30,000 lb/y melamine unit. $15 MM.Contractor: Becon. Completion: Oct. 1988.

MOBIL CHEMICAL. Joliet, Ill. 60 MM lb/y polystyrene expansion. Contractor: Santa Fe Braun. Completion: mid 1988.

***OCCIDENTAL CHEMICAL. Ingleside, Tex.** 8 MM lb/y ethylene dichloride unit in engineering stage. $40 MM. Eng: Bechtel. Contractor: Becon. Completion: March 1989.

ROHM & HAAS. Deer Park, Tex. Acetylene upgrading. $5 MM. Eng: Bechtel. Contractor: Becon. Completion: Aug. 1988.

*Acrylic acid expansion in engineering stage. Design: Bechtel. Completion: 1989.

***PHILLIPS 66. Pasadena, Tex.** 105 MMlb/y polyethylene debottleneck. Eng: S&B. Completion: Sept. 1988.

90 MMlb/y resins expansion. Eng: Kellogg. Completion: late 1989.

Sweeny, Tex. 1.5 billion lb/y ethylene expansion. Eng: Santa Fe Braun. Completion: late 1990.

SHELL CHEMICAL. Geismar, La. 243,000 mt/y linear higher olefins expansion. Feed: ethylene. Shell process. $90 MM. Contractors: Bechtel and Becon Const. Completion: 1989.

STANDARD OIL CHEMICAL. Green Lake, Tex. 23,000-95,000 mt/y maleic anhydride, 31,000 mt/y butanediol, 27,000 mt/y gamma-butyrolactone, 11,000 mt/y tetrhydrofuran. Feed: n-butane. Planned. Completion: 1990.

TEXAS EASTMAN. Longview, Tex. 100,000 mt/y polypropylene expansion. Completion: 1989.

ARGENTINA

DUPERIAL SAIC. San Lorenzo. 4,600 mt/y phthalic anhydride expansion planned. (17,000 mt/y total cap.) Feed: orthoxylene. Eng: Davy Powergas. Contractor: Duperial. Completion: 1989.

7,000 mt/y ethylene expansion under construction. Feed: naphtha, propane, butane. Contractor: Linde. Completion: late 1988.

ELECTROCLOR SAIC. Bahía Blanca. 41,500 mt/y polyvinyl chloride plant under construction. Feed: vinyl chloride. Contractor: McKee. Completion: mid 1989.

***MALEIC SA. Ensenada.** 8,000 mt/y maleic anhydride unit in engineering stage. Design: Scientific Design. Completion: 1989.

PETROQUÍMICA GENERAL MOSCONI. Ensenada. 25,000 mt/y butene-1 unit under construction. Feed: C_4 raff. Eng: Techint/Sulzer. Completion: 1988.

25,000 mt/y methanol unit under construction. Feed: natural gas. Eng: Techint/German Linde. Completion: 1988.

45,000 mt/y dimethyl terephthalate unit under construction. Feed: paraxylene. Eng: Krupp Koppers. Completion: 1989.

33,000 mt/y oxoalcohols unit under construction. Feed: olefins. Eng: Techint/CdF Chimie. Completion: 1988.

39,000 mt/y MTBE unit under construction. Feed: Ref. C_4. Eng: Techint/Snamprogetti. Completion: 1988.

40,000 mt/y higher olefins (Dimersol) unit under construction. Feed: propylene/butylenes. Eng: Techint/IFP. Completion: 1988.

17,000 mt/y polyethylene tet. unit under constructionFeed: DMT/ethylene glycol. Eng: Krupp Koppers. Completion: 1989.

BAHRAIN

***GULF PETROCHEMICAL INDUSTRIES CORP. Sitra.** 200 mt/d methanol, 200 mt/d ammonia expansion and revamp in engineering stage. Contractor: Krupp Koppers. Completion: 1988.

BELGIUM

BASF NV. Antwerp. 945 t/d nitric acid unit-.Contractor: Uhde. Completion: 1988.

***DEN NORSKE STATS OLJESEKSKAP AS.** and **HIMONT INC. Antwerp.** 150,000 mt/y polypropylene plant. Completion: late 1989.

FINANESTE.(65% Neste Oy, 35% Petrofina). **Antwerp.** 450,000 mt/y ethylene steam cracker.

***MONTEDIPE. Feluy.** 10,000 mt/y polystyrene unit under construction. Eng: Tecnimont. Completion: 1989.

***NESTE CHEMICALS BV. Beringen.** 120,000 mt/y polypropylene unit under construction. Eng: Tecnimont. Completion: 1989.

PETROFINA. Anterp. 20,000 mt/y synthetic rubber and thermoplastic elastomer plant. $27 MM.

BRAZIL

CAPUAVA CARBONOS INDUSTRIAIS. Triunfo, RS. 26,000 mt/y carbon black unit. Feed: ethylene tar. Planned. Completion: 1989.

***CIA. PETROQUIMICA DO NORDESTE. Camacari, Bahia.** 350,000 mt/y ethylene plant. Eng: Setal Engenharia (Lummus Crest affiliate).

COPENE. Camaçari. 25,000 mt/y butene 1. Feed: raffinate 2. $15 MM.

18,000 mt/y isoprene unit under construction. Feed: pentenes. $35 MM. Completion: 1989.

13,500 mt/y octenes unit under construction. Feed: raffinate 3. $6 MM. Completion: 1990.

15,000 mt/y n-butane unit under construction. Feed: LPG. $2 MM. Completion: 1988.

COPERBO. Cabo. 25,000 mt/y polyisoprene unit under construction. Feed: isoprene. Goodyear process. Completion: 1989.

NITRIFLEX. Camaçari, Bahia. 5,500 resins. $22 MM. Contractor: IESA. Completion: mid 1988.

Triunfo. 10,000 t/y epm-epdm units.Feed: ethylene, propylene. $40 MM. Contractor: SB Engenharia. Completion: mid 1988.

OXITENO. Triunfo. 25,000 mt/y acrylic acid, 30,000 mt/y acrylates. Feed: propylene. Planned. Completion: 1990.

20,000 mt/y MEK unit under construction. Feed: n-butenes. Completion: 1989.

PRONOR PETROQUIMICA. Camaçari. 10,000 mt/y MDI. Feed. benzene. Completion: 1988.

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PETROCHEMICAL

BULGARIA

Burgas. 150,000 mt/y ethylene plant. Lic: Kellogg. Eng: Kellogg-Kawasaki. Contractor: Neftochim. Completion: 1990

***Devnja.** 150,000 mt/y vinylchloride monomer, 120,000 mt/y ethylene dichloride units in engineering stage. Contractor: TEC. Completion: 1990-91.

CANADA

ALBERTA GAS ETHYLENE. Joffre, Alberta. 1.5 billion lb/y ethylene plant. Planned. $400 MM. Completion: 1991.

ALBERTA NATURAL GAS. Scotford. 2,000 t/d methanol, 11,600 b/d MTBE. Feed: natural gas, butane. Before ERCB. $600 MM.

***KEMTEC. Montreal, Que.** 400 MMlb/y paraxylene, 150,000 t/y cumene units in engineering stage. Contractor: Partec Lavalin. Completion: 1989.

CHILE

CAPE HORN METHANOL LTD. Punta Arenas. 748,000 mt/y methanol unit under construction. Lic: BASF. Eng-contractor: Kellogg. Completion: 1988.

CHINA

Beijing. 60,000 mt/y styrene plant. Monsanto/LCI tech. $30 MM. Contractor: Lummus Crest. Completion: mid 1988.

***Fushun, Liaoning Province.** 60,000 mt/y polypropylene unit under construction. Eng: Tecnimont. Completion: 1989.

50,000 mt/y ethylene oxide and ethylene glycol units. Royal Dutch Shell process. $53.5 MM. Contractor: Technip. Completion: 1991.

Harbin. 22,000 mt/y phthalic anhydride plant under construction. Contractor: Davy McKee. Completion: 1989.

Jinan. 75,000 mt/y purified terephthalic acid in engineering stage. Contractor: MES. Completion: 1991.

Luzhou. 71,500 mt/y (250,000 mt/y total capacity) urea expansion under construction. Design-eng: Tecnimont. Completion: 1988.

150 t/d ammonia expansion under way. $10 MM. Contractor: Humphreys & Glasgow.

Panjing, Liaoning Province. 130,000 mt/y ethylene plant. Feed: ethane, propane, butane from Liao He field. Design-eng-tech: Lummus Crest. Contractors: TEC, C. Itoh, and TPL. Completion: Sept. 1991.

125,000 mt/y lld polyethylene, 40,000 mt/y polypropylene, 10,000 mt/y butene 1 units. Lic: BP on polyethylene, Mitsui PC on polyprop, IFP on butene. Contractor: Technipetrol. Completion: March 1991.

Puyang. 1,000 mt/d ammonia plant. Feed: natural gas. Contractor: Uhde. Completon: 1989.

1,760 mt/d urea unit in engineering stage. Contractor: Snamprogetti. Completion: 1989.

Shengli. 80,000 mt/y SBR unit under construction. Contractor: Mitsubishi Heavy.

Shanxi. 300 mt/y ammonia under construction. Feed: coal. Topsoe process. Contractor: Lurgi.

Tianjin. 20,000 mt/y propylene oxide unit. Contractor: TEC. Completion: 1989.

***CHINA HUNAN IMPORT CORP. Zhuzhou.** 25,000 mt/y polyvinyl chloride resins in engineering stage. Contractor: MES. Completion: 1989.

CHINA NORTH INDUSTRIES CORP. Lanzhou. 44 MM lb/y toluene diisocyanate plant. Contractor: BASF AS.

DONG TING NITROGEN FERTILIZER COMPLEX. Yueyang, Hunan. 1,000 mt/d ammonia unit in engineering stage. Lic: Kellogg. Eng: Sinokellogg. Contractor: Sinopec. Completion: 1989.

JILIN CHEMICAL IND. Jilin. 9,500 mt/y polystyrene unit in engineering stage. Contractor: Toyo. Completion: 1989.

LANZHOU CHEMICAL INDUSTRY CO. Lanzhou. 60,000 mt/y lld polyethylene plant. Lic: BP. Eng: SinoKellogg. Contractor: Sinopec. Completion: 1990.

***PANZHIHUA IRON AND STEEL WORKS. Dukou.** 7,000 mt/y ammonia, 8,000 mt/y sulfuric acid units in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

QILU PETROCHEMICAL. Qilu, Shandong Province. 63,500 t/y polypropylene plant. Himont tech. $40-50 MM. Eng: Tecnimont. Completion: late 1989.

SHANGHAI PETROCHEMICAL COMPLEX. Shanghai. 120,000 mt/y ethylene glycol-ethylene oxide units under construction. Design: Scientific Design. Contractor: TEC. Completion: 1989.

70,000 mt/y polypropylene unit. Contractor: Tecnimont. Completion: 1990.

SICHUAN CHEMICAL WORKS. Sichuan. 600 mt/d ammonia-fertilizer plant. $50 MM. Contractor: MW Kellogg. Completion: late 1989.

SINOPEC INTERNATIONAL. Daqing. 60,000 mt/y ethylene expansion under construction. Contractor: Mitsubish Heavy Ind. Completion: 1988.

Ganzu. 80,000 mt/y ethylene revamp under construction. Lic-eng: Kellogg-Sinopec. Completion: 1988.

XIANGTAN FINE CHEMICAL CO. Hunan Province. 1,500 mt/y skid-mounted ethylene amine plant. Prebuild and ship by MACC, Calgary and Fort Saskatchewan Eng. Serv., Canada. $2 MM.

YANSHAN UNITED FOREIGN TRADE CL. Yanshan and Shandong provinces. 120,000 mt/y styrene plant. Monsanto/LCI tech. Contractor: Lummus Crest. Completion: mid 1988.

CHINA, TAIWAN

CHINA AMERICAN PETROCHEMICAL CL. Lin Yuan. 225,000 mt/y terephthalic acid-phthalic anhydride units. Contractor: Chiyoda. Completion: Oct. 1989.

CHINESE PETROLEUM CORP. Kaohsiung. 400,000 mt/y ethylene, 230,000 mt/y propylene, 67,500 mt/y butadiene, 239,000 mt/y aromatics units under construction. Feed: LPG, naphtha, gas oil. Contractors: Kellogg and CTCI. Completion: mid 1991.

CHINA PETROCHEMICAL DEVELOPMENT CORP. Kaohsiung. 2,000 mt/y naphthalene unit under construction. Feed: fuel oil.

Ta-Sheh. 66,000 mt/y acrylonitrile expansion planned. Feed: propylene. 80,000 mt/y acetic acid expansion planned. Feed: carbon monoxide.

Toufen. 65,000 mt/y caprolactam expansion planned. Feed: cyclohexane.

CHIUNGLONG PETROCHEMICAL CL. Kaohsiung. 22,000 mt/y polypropylene glycol unit under construction.

FORMOSA CHEMICALS & FIBRES CORP. Suao. 200,000 mt/y terephthalic acid unit under constructon. Contractor: Zimmer. Completion: 1988.

200,000 mt/y ethylbenzene-styrene monomer unit. Mobil/Badger vapor phase and Cosden/Badger processes. Completion: mid 1989.

FORMOSA PLASTICS CORP. Lin Yuan. 450,000 mt/y ethylene plant under construction. Feed: naphtha. Design-eng: Stone & Webster. Completion: early 1989.

HO TUNG CHEMICAL CORP. Jen-Wu, Kaohsiung. n-paraffins plant under construction. Feed: kerosine, light diesel.

NAN YA PLASTICS CORP. 250,000 mt/y phthalic anhydride unit in engineering stage. Von Heyden low energy process. Contractor: Davy McKee. Completion: 1990.

TAIWAN POLYPROPYLENE CL. Kaohsiung. 60,000 mt/y polypropylene expansion under construction. Lump sum contract: JGC Corp. Completion: May 1988.

***TAIWAN SM CORP. Kaohsiung.** 100,000 mt/y ethylbenzene/styrene monomer unit in engineering stage. Contract: Mobil-Badger and Cosden-Badger technology.

USI FAR EAST CORP. Kaohsiung. 113,000 mt/y lld polyethylene unit under construction. Feed: ethylene. Contractors: CTCI and Mitsubishi HI. Completion: Spring 1989.

COLOMBIA

CARBOQUIMICA. Bogota. 20,000 mt/y plasticizers expansion. Planned. Feed: phthalic anhydride, oxoalcohols. Staff will build.

PETROQUIMICA COLOMBIANA. Cartagena. 120,000 mt/y polypropylene unit. Union Carbide/Shell Unipol process. Begin construction: early 1988. Completion: 1989.

CZECHOSLOVAKIA

***DUSLO NP. Sala.** Ammonia revamp in engineering stage. Contractor: Krupp-Koppers. Completion: 1988.

Kralupy. Revamp of styrene units. 18,000 mt/y: 1 line complete, 3 lines under construction. Contractor: Technip. Completion: 1988.

FINLAND

NESTE OY. Porvoo. 30,000 mt/y (530 mt/y total cap.) ethylene expansion under construction. Contractor: Neste Eng. Completion: Spring 1988.

120,000 mt/y polypropylene unit under construction. Contractors: Tecnimont/Neste Eng. Completion: late 1988.

FRANCE

***ARCO FRANCE. Fos-sur-Mer.** 420 mt/y MTBE unit in engineering stage. Lic: Arco. Contractors: Foster Wheeler and Technip. Completion: 1988.

150,000 mt/y propylene oxide unit. Contractors: Foster Wheeler and Technip. Completion: 1988.

380,000 mt/y gasoline grade TBA in engineering stage. Contractors: Foster Wheeler and Technip. Completion: 1988.

50,000 mt/y propylene glycol unit. Contractors: Foster Wheeler and Technip. Completion: Sept. 1988.

***BEAULIEU. Dunkirk.** 120,000 mt/y polypropylene unit in engineering stage. $80 MM. Lic. Union Carbide. Eng: John Brown. Completion: 1989.

***MOBIL OIL. Notre Dame de Gravenchon.** 12,000 mt/y poly alfaolefins in engineering stage. Contractor: Serete. Completion: June 1989.

NORSOLOR. Saint Avold. 60,000 mt/y acrylic acid expansion under construction. Feed: propylene. Contractor: CdF Chimie. Completion: mid 1988.

GERMANY (EAST)

Berlin. 350,000 mt/y ethylene expansion under construction. Contractor: Linde.

Schkopau. 25,000 mt/y hd polyethylene plant under construction. Unipol process. Feed: ethylene. Contractor: Linde AG.

GERMANY, WEST

COLUMBIAN CARBON. Hamburg. Carbon black expansion planned. Feed: oil.

***DEUTSCHE TEXACO. Moers.** 10,000 mt/y maleic anhydride unit conversion (C_4) in engineering stage. Design: Scientific Design. Completion: 1990.

***DEUTSCHE SHELL CHEMIE. Cologne.** 120,000 mt/y polypropylene plant. Planned. Completion: 1989.

EC ERDOLCHEMIE. Cologne. 6,000 mt/y isoamylene unit. Completion: 1989-90.

***HULS. Marl.** 60,000 mt/y acrylic acid, acrylic ester in engineering stage. Design: JGC-Mitsubishi PC.

PHENOLCHEMIE. Gladbeck. 70,000 mt/y phenol, 43,000 mt/y acetone expansion under way. Feed: cumene. DM 50 MM. Staff. Completion: late 1988.

RHEINISCHE OLEFINWERKE. Wesseling. 230,00 mt/y ethylene, propylene, C_4, C_5 units under construction. Feed: naphtha. Contractor: Linde and KTI. Completion 1989.

***UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF. Wesseling.** 267,000 mt/y propylene unit. Contractor: German Linde. Completion: late 1989.

HUNGARY

BORSODI VEGYI KOMBINÁT. Kazincbarcika. 25,000 mt/y MDI, diphenylmethane diisocyanate. Feed: aniline. Contractors: Chisso, Mitsui Toatsu. Completion: 1990.

TISZAI VEGYT KOMBINAT. Leninváros. 60,000 mt/y polypropylene unit under construction. Feed: propylene. Contractor: Tecnimont. Completion: 1989.

INDIA

***ADARSH. Surat.** 3,000 mt/y maleic anhydride expansion in engineering stage. Design: Scientific Design. Completion: 1990.

ASIAN PAINTS INDIA LTD. Bombay. 13,500 t/y phthalic anhydride plant in engineering stage. Contractor: Davy McKee AG. Completion: 1989.

ARAVALI FERTILIZERS LTD. Sawai Madhopur, Rajasthan. 1,350 mt/d ammonia plant, two 1,100 mt/d urea plants. $370 MM. Snamprogetti tech. Completion: end 1988.

ASSAM INDUSTRIAL DEVELOPMENT CORP. Maron-Lakwa. Planned facility for 7,500 t/y methanol, 12,000 t/y formaldehyde, 6,000 t/y PVC. Engineering on methanol: Humphreys & Glasgow.

***CTI INVESTMENTS LTD. Manali, Madras.** 4,200 t/y MEK unit in engineering stage. $15 MM. Contractor: Davy Powergas India. Completion: 1990.

***DEEPAK FERTILIZERS & CHEMICALS CORP. LTD. Taloja, Maharashtra.** 300 t/d methanol unit in engineering stage. $70 MM. Contractor: Davy Powergas India. Completion: 1990.

FERTILIZERS & CHEMICALS TRAVANCORE LTD. (FACT) Udyogamandal. 50,000 mt/y caprolactam unit under construction. 225,000 mt/y ammonium sulphate under construction. Feed: ammonia, benzene, oleum, sulfur-di-oxide. Contractors: Chiyoda, FACT, Stamicarbon. Completion: 1988.

***GUJARAT NARMADA VALLEY FERTILIZER. Bharuch.** 300 t/d methanol unit under construction. Contractor: TEC. Completion: 1989.

***HALDIA PETROCHEMICALS. Calcutta.** 10,000 mt/y ethylene oxide, 60,000 mt/y ethylene glycol units in engineering stage. Design: Scientific Design. Completion: 1990.

Haldia. 60,000 mt/y polypropylene unit under construction. Contractor: Tecnimont. Completion: 1989.

HERDILLIA CHEMICALS LTD. Thane. 3,500 mt/y alkyl phenols unit planned. Feed: phenol olefins. Contractor: Power Gas India.

10,000 mt/y EDPM rubber. Feed: ethylene, propylene. Planned.

2,000 mt/y diphenyl oxide, 1,500 mt/y isopropyl phenols, 1,000 mt/y plasticizers units. Planned. Feed: phenol, propylene, phosphorous, oxychloride.

HINDUSTAN POLYMERS. Visakhapatnam.
5,000 mt/y ABS planned. Completion: Dec. 1988.

40,000 mt/y styrene expansion planned. Feed: ethylene, benzene.

12,000 mt/y polystyrene expansion planned. Feed: styrene.

INDIAN PETROCHEMICALS CORP. LTD.
Baroda.
NEW PROJECTS TO BE COMPLETED IN 1988:

13,500 mt/y linear alkyl benzene expansion. Lic-eng: UOP. Contractor: EIL.

10,000 mt/y dimethyl terephthalate expansion-Phase 3. Feed: naphtha. Lic-eng: Dynamit Nobel. Contractor: EIL.

24,400 mt/y orthoxylene expansion. Feed: naphtha. Contractor: EIL.

49,000 mt/y paraxylene, mixed xylenes expansion. Feed: naphtha. Lic-eng: UOP-Mobil. Contractor: EIL.

Nagothane.
NEW PROJECTS TO BE COMPLETED IN 1989:

300,000 mt/y ethylene, 30,000 mt/y propylene units, 36,000 mt/y FCC propylene recovery unit. Feed: gas. Lic: Stone & Webster. Contractor: EIL.

80,000 mt/y ld polyethylene unit. Feed: gas. Lic: CdF Chimie. Contractor: EIL.

135,000 mt/y lld-hd polyethylene unit under finalization. Feed: gas. Contractor: EIL.

50,000 mt/y ethylene glycol, 5,000 mt/y ethylene oxide, 3,600 mt/y diethylene glycol, 160 mt/y triethylene glycol units. Feed: gas. Lic: Union Carbide. Contractor: EIL.

6,000 mt/y polypropylene expansion under construction. Feed: gas. Lic: Tecnimont, Himont. Contractor: EIL.

1,740 mt/y acetylene black unit under finalization. Feed: gas. Contractor: EIL.

INDIAN RAYON CORP. LTD. Renukoot, Uttar Pradesh. 20,000 mt/y carbon black under construction. $35 MM. Contractor: Davy Powergas India. Completion: 1988.

INDO GULF FERTILIZERS & CHEMICALS CORP. LTD. Jagdishpur, Sultanpur UP. 2,200 mt/d urea (twin streams). 1,350 mt/d ammonia. Feed: natural gas. US $600 MM. Contractors: Snamprogetti-Italy, PDIL-India. Completion: May 1988.

NAGARJUNA FERTILIZERS & CHEMICALS LTD. Kakinada. 1,500 mt/y urea, 900 t/d ammonia units under construction. Feed: naphtha. Contractors: Snamprogetti, PDIL. Completion: 1990.

NATIONAL PETROCHEMICAL CORP. Koyali, Gujarat. 100,000 mt/y ethylene, 60,000 mt/y propylene, 9,000 mt/y butadiene, and 12,000 mt/y mixed butadienes.

***POLYPROPYLENE INDIA LTD. Mathura District.** 30,000 t/y polypropylene. Lic: Solvay tech. Completion: mid 1990. (29% Kanoria Group, 11% each Solvay, Pradeshiya Industrial Investment Corp., 49% public).

POLYCHEM LTD. Nira, Mzharashtra. 4,000 mt/y polyvinyl acetate, 2,000 mt/y polyvinyl alcohol units. Feed: vinyl acetate monomer. (Letter of Intent received from India Government).

RELIANCE INDUSTRIES LTD. Haldia. 100,000 t/y linear alkylbenzene unit in engineering stage. Contractor: Lummus Crest. Completion: 1988.

***Hazira.** Ethylene oxide-ethylene glycol units in engineering stage. Design: Scientific Design. Completion: 1990.

***RASHTRIYA ISPAT NIGAM. Visakhapatnam.** 22,000 mt/y BTX, 33,000 mt/y crude benzole hydrogenation units in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

SYNTHETICS & CHEMICALS LTD. Bareilly. 47,000 mt/y SBR plant, 14,000 mt/y butadiene, styrene, toluene expansion planned. Feed: benzene, ethyl alcohol, petrobutadiene.

INDONESIA

***PERTAMINA. Cilacap, Java.** 270,000 mt/y paraxylene, 123,000 mt/y benzene units in engineering stage. Contractor: Japan Gasoline. Completion: 1990.

PERTAMINA, BRITISH PETROLEUM, CHEVRON (Gulf Corp.). Sengkang gas field, south Sulawesi. 1,500 mt/d ammonia plant. $276 MM. Planned. Completion: 1989.

PT PETROWIDADA (40% Daewoo Corp.-Korea, 60% PT Petrokimia Gresik and PT Witulan). **Gresik, East Java.** 30,000 t/y phthalic anhydride, 1,500 t/y maleic anhydride plant. $18 MM. Eng-manage: Daewoo. Contractor: Lurgi.

PT PUPUK KALIMANTAN TIMUR. Bontang. 1,000 mt/d ammonia, 1,700 mt/d urea units under construction. Contractor: Chiyoda. Completion: 1988.

IRAN

NATIONAL PETROCHEM. Arak. 240,000 mt/y ethylene plant. 60,000 mt/y lld polyethylene plant. 60,000 mt/y hd polyethylene plant. $1.5 billion. Contractors: Technipetrol and KTI. Uhde on hd polyethylene. Completion: 1992.

Esfahan. 50,000 mt/y linear alkylbenzene unit. Contractor: Snamprogetti. Completion: 1989.

60,000 mt/y dimethyl terephthalate unit under constructon. Contractor: Krupp Koppers. Completion: 1989.

Shiraz. 1,200 mt/d ammonia unit under construction. Contractor: Humphreys & Glasgow.

IRAQ

Baiji. 1,000 t/d ammonia plant under construction. Lic-eng: Kellogg. Contractor: Hitachi Zosen. Completion: 1988.

1,750 t/d urea plant under construction. Lic: Stamicarbon. Eng: Kellogg. Contractor: Hitachi Zosen. Completion: 1988.

ITALY

ENICHEM. Porto Torres. 80,000 mt/y polyvinyl chloride unit under construction. Contractor: Snamprogetti. Completion: 1988.

Ravenna. 115,000 mt/y butadiene extraction expansion. Contractor: Snamprogetti. Completion: 1988.

***INCA INTERNATIONAL. Pisticci.** 30,000 mt/y polyethylene terephthalate unit under construction. Contractor: Snamprogetti. Completion: 1988.

MARGHERA BUTADIENE SpA. Porto Marghera. 60,000 butadiene extraction unit under construction. Contractor: Tecnimont. Completion: 1989.

JAPAN

GEM CHEMICALS LTD. Chiba. 60,000 mt/y bisphenol-A unit under construction. Contractor: MES. Completion: Sept. 1988.

IDEMITSU PETROCHEMICAL. Tokuyama. 100,000 mt/y paraxylene unit. UOP parex.

SHIN-DAIKYOWA PETROCHEMICAL CL. Yokkaichi. 15,000 mt/y maleic anhydride unit under construction. Feed: butane. Completion: Sept. 1988.

STANDARD OIL CHEMICAL CO. with MITSUI TOATSU. Osaka. 9,000 mt/y maleic anhydride conversion. Feed: n-butane. Planned. Completion: 1989.

TONEN SEKIYUKAGAKU. Wakayama. 100,000 mt/y paraxylene expansion. Feed: reformate. Completion: mid 1988.

KOREA

ARCO CHEMICAL and YUKONG LTD. Ulsan. Propylene oxide and styrene units. Badger process. Arco technology.

DEMOCRATIC PEOPLE'S KOREAN REPUBLIC. 10,000 t/y ethylene oxide-glycol plant. $6.5 MM. Contractors: Japan Catalytic Chemical and Hitachi Shipbuilding & Engineering.

DAINONG PETROCHEMICAL INDUSTRY CL. Ulsan. 1,000 mt/y phthalic anhydride unit under construction. Feed: maleic anhydride.

***DONG BU PETROCHEMICAL. Ulsan.** 15,000 mt/y polystyrene, 35,000 mt/y high impact polystyrene units under construction. Atochem process. Contractor: Technip. Completion: 1989.

HANKOOK CAPROLACTAM CORP. Ulsan. 40,000 mt/y caprolactam unit. Contractor: Chiyoda. Completion: 1988.

HANNAM CHEMICAL. Ulsan. 20,000 mt/y polypropylene glycol unit under construction. Feed: propylene oxide. Lic: Dow. Completion: June 1988.

HONAM OIL REFINRY (Lucky Ltd. and Caltex Overseas). **Yeocheon.** 250,000 mt/y ethylene plant. $150 MM. Eng: Lummus Crest. Contractor: TEC. Completion: 1988.

***KOHAP-CHEM. CORP. Ulsan.** 100,000 mt/y terephthalic acid. Eng: Tecnimont. Completion: 1989.

KOREA KUMHO PETROCHEMICAL CL. Yeochon. 55,000 mt/y polybutadiene expansion under construction. Feed: butadiene. Contractor: JSR-Japan. Completion: Sept. 1989.

35,000 mt/y butadiene expansion under construction. Feed: C_4. Contractor: BASF. Completion: Sept. 1988.

***SUNKYONG FIBRES LTD. Ulsan.** 247,000 mt/y CTA, 160,000 mt/y PTA, 100,000 mt/y dimethyl terephthalate units under construction. $122 MM. Contractor: Fluor Daniel. Completion: 1989.

YUKONG LTD. Ulsan. 250,000 mt/y ethylene under construction. 108,000 mt/y propylene. 39,000 mt/y butadiene. $150 MM+. Eng-design: MW Kellogg. Contractor: Niigata on ethylene. Completion: late 1989.

40,000 mt/y propylene oxide unit. Feed: ethylene, propylene, benzene. Completion: mid 1989.

200,000 mt/y paraxylene, 50,000 mt/y orthoxylene units. Feed: xylene mix. Completion: late 1989.

80,000 mt/y polyethylene. Feed: ethylene. Completion: mid 1989.

100,000 mt/y polypropylene unit under construction. Eng: Tecnimont. Completion: 1989.

KUWAIT

KNPC. Mina Al-Ahmadi. 1,300 MTBE unit. Feasibility study: Santa Fe Braun Inc.

PETROCHEMICAL INDUSTRIES. Shuaiba. 80,000 mt/y polypropylene unit. Feed: propylene. Eng-design-const: Santa Fe Braun. Postponed.

LIBYA

RAS LANUF REFINERY AND GAS PROCESSING. Ras Lanuf. 330,000 mt/y ethylene plant under construction. Manage- coordinator: Technimont. Competion: 1989.

LUXEMBOURG

DU PONT DE NEMOURS. Contern-Hesperange. 20,000 mt/y polyolefin unit under construction. Feed: hd polyethylene. $180 MM. Eng: John Brown. Completion: 1988.

MAYLASIA

PETRONAS. Kuantan. 300,000 mt/y MTBE, 50,000 mt/y propylene units planned. Completion: early 1990's.

MEXICO

PEMEX.

Camargo, Chihuahua. 1,500 mt/d ammonia unit under construction. Lic-eng: Kellogg. Completion: June 1989.

Cosoleacaque, Ver. 825,000 mt/y methanol unit in engineering stage. Contractor: Uhde-IMP. Completion: Dec. 1990.

La Cangrejera. 80,000 mt/y polyethylene unit under construction. Contractor: ICI. Completion: June 1989.

120,000 mt/y cyclohexane unit in engineering stage. Completion: 1988.

Lazaro Cardenas, Mich. 445,000 mt/y ammonia unit under construction. Lic-eng: Kellogg. Completion: 1989.

Morelos. 350,000 mt/y propylene unit. Feed: propane. Lic: Houdry. Contractor: Bufete. Completion: June 1988.

100,000 mt/y polyethylene unit under construction. Contractor: Asahi. Completion: Dec. 1988.

100,000 mt/y butadiene unit in engineering stage. Completion: 1989.

75,000 mt/y isopropanol unit in engineering stage. Completion: 1988.

100,000 mt/y polypropylene unit under construction. Completion: 1988.

150,000 mt/y acetaldehyde unit in engineering stage.

Salamanca. 60,000 mt/y normal paraffins and 50,000 mt/y olefins units planned. Completion: Oct-Dec. 1988.

Salina Cruz, Oax. 1,500 mt/d ammonia unit.Contractor: Kellogg. Completion: Dec. 1988.

Tula. 60,000 mt/y normal paraffin and 50,000 mt/y olefin units planned. Completion: Oct-Dec. 1988.

NETHERLANDS

ARCO CHEMIE. Botlek plant, Rotterdam. 370,000 mt/y MTBE unit under construction. Contractor: Fluor Daniel. Completion: 1988.

DSM. South Limburg. 20,000 mt/y (70,000 total cap.) edpm rubber expansion planned.

15,000 mt/y (65,000 total cap.) ABS expansion under study.

SHELL NEDERLAND CHEMIE. Pernis. 100,000 t/y MTBE unit. Planned.

NIGERIA

NIGERIAN NATIONAL PETROLEUM CORP.
Port Harcourt, Rivers state.

Petrochemical complex comprising:

400,000 mt/y ethylene, 100,000 mt/y propylene, 270,000 mt/y polyethylene, 35,000 mt/y ethylene glycol, 70,000 mt/y polypropylene, 15,000 mt/y butene 1, 100,000 chlorine-caustic soda, 145,000 m/ty vinyl chloride monomer, 140,000 mt/y polyvinyl chloride, 30,000 mt/y plasticizers, 26,000 m/ty 2 ethylhexane, 15,000 mt/y phthalic anhydride. $2 billion. Consult-manage-supervisor: Foster Wheeler. Completion: 1990.

PAKISTAN

DAWOOD HERCULES CHEMICAL LTD. Chichoki Mallian. Urea modernization under study. Planned.

POLAND

***VARIMEX. Warsaw.** 43,000 mt/y ethylene expansion. Contractor: KTI. Completion: 1988.

SAUDI ARABIA

ARABIAN PETROCHEMICAL. (100% Saudi Basic). **Al Jubail.** 100,000 t/y polystyrene unit, 50,000 mt/y butene-1 unit under construction. Lic: Cosden Tech. and Chimique Charbonnages-France. Contractor: Chiyoda. Completion: 1988.

SAUDI EUROPEAN PETROCHEMICAL. (Sabic, Apicorp, Enichem-Italy, Neste Oy-Finland.) **Al-Jubail.** 500,000 mt/y MTBE. Feed: methanol, butane. $600 MM. Eng-management: Snamprogetti. Completion: 1988.

***YANPET. Yanbu.** 110,000 mt/y ethylene glycol unit in engineering stage. Design: Scientific Design. Completion: 1989.

SOUTH AFRICA

AECI Ltd. Midland, Sasolburg. 25,000 mt/y vinyl chloride-polyvinyl chloride expansion under construction. Feed: coal-based acetylene. Completion: end 1988.

SPAIN

***AISCONDEL . Tarragona.** 30,000 mt/y polyvinyl chloride expansion. Completion: late 1988.

CEPSA. Algeciras. 45,000 mt/y MTBE unit. Lic: UOP.

ENFERSA. Cartagena, Murcia. 30,000 mt/y urea (and ammonia) revamp. Contractor: Uhde. 1989.

830 mt/d ammonia synthesis unit under construction. Eng: Krupp-Koppers. Completion: 1988.

Puertollano. 35,000 mt/y urea (and ammonia) revamp. Contractor: Uhde. 1989.

HIMONT (Hercules Inc. and Montedison SpA). 25,000 mt/y polypropylene plant. Planned.

REPSOL PETROLEO. La Coruña. 30,000 mt/y MTBE unit. Feed: C_4 FCC, coker. Process: UOP Hüls. Completion: end 1988.

Puertollano. 53,000 mt/y MTBE unit. Feed: raffinate 1, C_4 FCC. Completion: Spring 1989.

Tarragona. 50,000 mt/y MTBE unit. Feed: raffinate 1. Process: UOP-Hüls. Tecnicas Reunidas. Completion: mid 1988.

REPSOL QUIMICA. Puertollano. 40,000 mt/y lld polyethylene unit. 20,000 mt/y polypropylene expansion. Planned.

Tarragona. 100,000 mt/y polypropylene plant. Himont Spheripol process. $40 MM. Eng: Tecnimont. Completion: Spring 1989.

SWEDEN

***NOBEL CHEMATUR. Stenungsund.** 40,000 mt/y ethylene unit (from ethanol) in engineering stage. Design: Scientific Design.

TANZANIA

KILWA AMMONIA CO. Kilwa Masoko. $400 MM ammonia plant. Feed: natural gas (from Songo Songo Island field).

THAILAND

ETERNAL PETROCHEMICAL CL. Bangkok. 45,000 mt/y phthalic anhydride unit in engineering stage. Von Heyden low energy process. Contractor: Davy McKee. Completion: 1989.

HMC POLYMERS CL. (Metro CL-Bangkok and Himont Inc.). **Mab Ta Pud, (Rayong province).** 100,000 mt/y polypropylene under construction. $30 MM. Eng: Tecnimont-Italy, Kobe-Japan. Completion: 1989.

NATIONAL FERTILIZER CORP. Rayong. 900 t/d ammonia, 1,000 t/d urea. Eng-consult: Foster Wheeler Int'l. Chiyoda. Completion: 1988.

NATIONAL PETROCHEMICAL CORP. Mab Ta Pud. 315,000 mt/y ethylene, 105,000 mt/y propylene units. Eng: Lummus Crest. Contractor: Toyo EC. Completion: Aug. 1989.

THAI PETROCHEMICAL INDUSTRY CORP. Rayong. 1,750 t/d urea and 1,000 t/d ammonia units. $180 MM. Turnkey: Chiyoda. Completion: 1988.

THAI PLASTIC AND CHEMICAL CL. Rayon. 140,000 mt/y vinylchloride monomer, 26,000 mt/y caustic soda, 60,000 mt/y polyvinylchloride in engineering stage.Contractor: TEC. Completion: late 1990.

THAI POLYETHYLENE CL. Rayong Province. 60,000 mt/y lld polyethylene plant under construction. BP gas phase process. Contractor: Mitsui Eng-Ship. Completion: late 1989.

60,000 mt/y hd polyethylene unit. Contractor: MES. Completion: 1989.

TRINIDAD

***GOVERNMENT OF TRINIDAD-TOBAGO** (51%), **MW KELLOGG** (24.5%), **NORSK HYDRO** (24.5%). **Point Lisas.** 1,500 mt/d ammonia plant. Contractor: Kellogg.

FERTILIZERS OF T&T LTD. Point Lisas. Two 230 mt/d ammonia expansions planned. $14 MM each. Completion: 1989.

TURKEY

ISTANBUL GÜBRE SANAYII AS. Izmit. 1,200 mt/d (total cap.) ammonia expansion in engineering stage. Feed: natural gas. Contractor: Uhde. Completion: 1988.

TUGSAS (Turkiye Gubre Sanayii AS). **Gemlik.** 1,000 t/d ammonia unit under construction. Lic-eng: Kellogg. Completion: 1988.

UNITED KINGDOM

BP CHEMICALS LTD. Hull. 200,000 mt/y mixed acetyls, acetic acid-acetic anhydride under construction. $140 MM. Manage: Davy McKee. Completion: 1989.

L&K FERTILIZERS LTD. (subsidiary of Kemira Oy). **Hull.** 250,000 mt/y ammonia plant. Feed: acetic acid hydrogen-nitrogen byproducts (from BP plant). Eng: MW Kellogg. Completion: 1988.

SHELL CHEMICALS UK. Carrington. 100 t/y polypropylene expansion under construction. Completion: end 1988.

U.S.S.R.

Blagoveshchensk. 230,000 mt/y pure terephthalic acid in engineering stage. Contractor: MES. Completion: 1992.

Budyennovsk. 100 mt/y polypropylene in engineering stage. $146 MM. Contractor: John Brown. Completion: 1990.

Dzerzhinsk. 25,000 mt/y acrylic acid, 40,000 mt/y acrylic esters, 40,000 mt/y acrylic emulsions in engineering stage. Processes: Nippon Shokubai KK, Dainippon Ink. Consortium coordinator: Nissho Iwai. Contractor: Mitsubishi HI. Completion: March 1991.

Mogilev. 25,000 mt/y dimethyl terephthalate expansion in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

Nevinnonysk. 150,000 mt/y acetic acid in engineering stage. Contractor: MES. Completion: 1990.

Nishnekamsk. 200,000 mt/y linear alphaolefins unit under construction. Contractor: Davy McKee. Completion: 1989.

Polotsk. 60,000 t/y ethylene-propylene and 55,000 t/y acrylonitrile.

Sumgait (Baku). 75,000 mt/y linear alkyl benzene unit under construction. Contractor: Snamprogetti. Completion: 1989.

VENEZUELA

CORPOVEN. Puerto Cabello. 2,500 b/d BTX unit. Eng-lic: UOP. $50 MM. Engineering stage. Completion: 1989.

PEQUIVEN. El Tablazo, Zulia. 200,000 mt/y ethylene unit planned. Feed: ethane. Completion: 1992.

600,000 mt/y polyvinyl chloride unit planned. Feed: vinyl chloride. Completion 1992.

60,000 mt/y ethylene dichloride and vinyl chloride units planned. Feed: ethylene, chloride. Completion: 1992.

Jose, Anzoategui. 500,000 mt/y MTBE unit in engineering stage. Feed: Butanes, methanol. Contractor: Snamprogetti. Completion: 1990.

495,000 mt/y ammonia unit. Feed: natural gas. Eng: Santa Fe Braun. Completion: 1990.

Morón, Carabobo. 495,000 mt/y ammonia unit planned. Feed: natural gas. Completion: 1991.

247,500 mt/y urea unit planned. Feed: ammonia. Completion 1991.

308,000 mt/y solution urea. Feed: ammonia. Planned. Completion: 1991.

700,000 mt/y fertilizer plant. Contractor: Davy McKee. Completion: 1989.

PROPILVEN SA. El Tablazo, Zulia. 70,000 mt/y polypropylene unit. Feed: propylene. (Pequiven, Grupo Zuliano, Mitsui Petchem., Promotora Venoco). Completion: 1990.

OGJ REPORT

FORECAST REVIEW

Production slide and demand growth will moderate during the coming year

Robert J. Beck
Economics Editor

Stable oil prices gave a slight boost to exploration and drilling activity in 1987, but did not prevent the continued slide in U.S. production.

Another substantial increase in Alaskan production coupled with a modest expansion in Lower 48 drilling activity will slow the rate of decline this year, but U.S. production will continue to slip.

Demand growth will slow, too. The October stock market crash is expected to reduce investment and limit economic activity. And that will dampen the increase in energy—and oil—demand this year.

Though growth will be slower, low product prices will increase demand.

Still lower production and higher demand mean U.S. imports of crude and products will keep growing.

Stable—and possibly slowly rising—crude prices, coupled with the improved financial condition of many companies resulting from restruc-

	1986	1987	% change 1987/86	1988 trillion BTU	% change 1988/87	% share of market 1988
	— Trillion BTU —					
Oil	32,176	32,660	+ 1.5	32,890	+ 0.7	43.3
Natural gas	16,708	16,465	− 1.5	16,540	+ 0.5	21.8
Coal	17,266	17,625	+ 2.1	17,680	+ 0.3	23.2
Hydro & geothermal	3,626	3,456	− 4.7	3,600	+ 4.2	4.7
Nuclear	4,475	4,945	+10.5	5,300	+ 7.2	7.0
Total	74,253	75,150	+ 1.2	76,010	+ 1.1	100.0

Source: 1986 DOE; 1987 and 1988 OGJ estimates.

	1985	1986	1987	% change 1987/86	1988 Billion cu ft	% change 1988/87
	——	Billion cu ft	——			
Production						
Texas	6,053	6,152	6,050	− 1.7	5,990	− 1.0
Louisiana	5,014	4,895	5,025	+ 2.7	5,080	+ 1.1
Other states	6,131	5,744	5,915	+3.0	5,930	+ 0.3
Total production	17,198	16,791	16,990	+ 1.2	17,000	+ 0.1
Imports						
Canada	925	748	860	+ 15.0	900	+ 4.7
Mexico	0	0	0	—	0	—
LNG	24	2	0	—	0	—
Total imports	949	750	860	+ 14.7	900	+ 4.7
Supplemental gas	126	113	150	+32.7	150	—
Losses, etc.*	−1,169	−1,225	−1,700	+ 38.8	−1,700	—
Total new supply	17,104	16,429	16,300	− 0.8	16,350	+ 0.3
Supply from storage	+ 234	− 147	− 255	—	− 225	—
Total supply	17,338	16,282	16,045	− 1.5	16,125	+ 0.5
Exports	57	61	60	− 1.6	60	—
Total consumption	17,281	16,221	15,985	− 1.5	16,065	+ 0.5

* Extraction losses, nonfuel gas, and unaccounted-for gas.

Source: 1985 and 1986 DOE; 1987 and 1988 OGJ estimates.

turing, are expected to give a small boost to drilling activity in 1988.

But how much of a recovery in U.S. exploration and development occurs will depend in large part on actions taken elsewhere. OPEC's production policy—and its ability to make members stick to the policy—will be the key to crude prices.

And oil and gas price levels and the perception of price stability will determine drilling and spending levels.

Here are highlights of OGJ's forecast for 1988:

- Total U.S. energy demand will increase 1.1% to 76.01 quadrillion BTU (quads). Consumption of all major energy forms will increase; nuclear will grow at the highest rate with a 7.2% gain, hydroelectric and geothermal energy will increase by 4.2%.
- U.S. petroleum product demand will increase 0.7% in 1988 to 16.66 million b/d, highest since 1980.
- Crude and condensate production in the U.S. will fall 1.8% to 8.15 million b/d. Over the 3-year span 1985-88, domestic production will be down 821,000 b/d, or 9.2%.
- Total imports are expected to increase another 5% to 6.805 million b/d this year, representing 40.8% of total U.S. demand.
- Gas consumption in the U.S. will increase only 0.5% to 16.065 tcf. Production will increase only 0.1% to 17 tcf as imports increase.
- The refinery utilization rate will move up to 83%. Total input to refinery stills will increase 0.7% to 13.035 million b/d; capacity is expected to remain at about 15.7 million b/d.
- The active rotary rig count is expected to move up to 1,080 this year from an all time low of 937 in 1987. Well completions will gain as a result.

Production

U.S. crude production fell 4.4% to an average of 8.3 million b/d during 1987. A low level of drilling activity and the shut in of unprofitable wells caused the decline.

Output has fallen 671,000 b/d over the last 2 years.

Production in 1988 is expected to be at the lowest level since 1977 when Prudhoe Bay went on stream.

The 1987 drop came even though Alaskan production hit a new high of 1.948 million b/d, up 81,000 b/d. Lower 48 production fell 461,000 b/d to 6.352 million b/d.

Along with OGJ's forecast drop in U.S. oil production to 8.15 million b/d in 1988, natural gas liquids (NGL) production is also expected to slip to 1.635 million b/d, down 1.2%.

The combined result will be a 1.7% drop in U.S. total liquids production to 9.785 million b/d. Total liquids production in 1987 was down 3.2% from 1986.

The slower rate of decline in U.S. crude production this year will result from increased Alaskan production and expanded drilling activity in the Lower 48. Alaskan production should move up to 2 million b/d in 1988.

Economic growth and energy

Though it is not yet certain, it appears that the stock market dip will slow economic growth a bit in 1988, but a recession is not expected.

Real gross national product (GNP) in constant 1982 dollars is forecast to increase 2.3% to $3.9 trillion this year. The rate of growth will be lower than in the past 2 years.

Industrial production is also expected to increase at a slightly slower rate this year than in 1987; 2.5% in 1988 compared to 2.9% last year.

From 1982 through 1987, real GNP increased 20.5%.

The rate of inflation is also expected to increase slightly in 1988. The GNP implicit price deflator should increase 3.9% in 1988, up from 3.2% in 1987.

Energy consumption per dollar of GNP will drop to 19,500 BTU this year, down from 19,700 BTU in 1987 and 20,000 BTU in 1986.

Over the period 1970-86, this ratio has fallen 29.1%.

Oil's share of the energy market dropped from 48.7% in 1977 to 41.8% in 1985, but regained some of that lost share in 1986 and 1987. Oil's share was 43.4% in 1987 and is expected to be 43.3% this year.

In 1986, for the first time, the average price that steam electric utility plants paid for heavy oil fell below the price for natural gas. The result was substitution of heavy oil for natural gas.

In response, natural gas prices fell and slowed the decline in market share. Natural gas accounted for 24.1% of the energy market in 1985, 22.5% in 1986, and 21.9% in 1987. Apparent natural gas consumption fell

OGJ forecast of U.S. supply and demand

(Thousands of barrels daily)

	Year 1988	% change 88/87	Year* 1987	% change 87/86	–1st qtr. 1988– Volume	% Change	–2nd qtr. 1988– Volume	% Change	–3rd qtr. 1988– Volume	% Change	–4th qtr. 1988– Volume	% Change
DOMESTIC DEMAND												
Motor gasoline	7,220	+ 0.8	7,165	+ 1.9	6,810	+ 1.6	7,425	− 0.1	7,445	+ 1.3	7,200	+ 0.5
Dist. 1-4	6,003	+ 0.7	5,963	+ 1.6	5,634	+ 1.6	6,180	− 0.5	6,181	+ 1.3	6,017	+ 0.4
Dist. 5	1,217	+ 1.2	1,202	+ 3.1	1,176	+ 1.3	1,245	+ 1.2	1,264	+ 1.2	1,183	+ 1.3
Naphtha jet fuel	210	—	210	+ 4.0	200	+ 3.6	210	+ 3.4	220	− 1.0	210	− 5.4
Dist. 1-4	147	—	147	+ 4.3	139	+ 3.7	144	+ 5.1	156	− 1.3	149	− 6.3
Dist. 5	63	—	63	+ 3.3	61	+ 3.4	66	—	64	—	61	− 3.2
Kerosine jet fuel	1,215	+ 5.2	1,155	+ 4.5	1,195	+ 2.3	1,180	+ 7.3	1,235	+ 9.2	1,250	+ 2.4
Dist. 1-4	868	+ 4.0	835	+ 3.7	866	+ 0.1	833	+ 6.8	881	+ 9.6	892	+ 0.1
Dist. 5	347	+ 8.4	320	+ 6.7	329	+ 8.6	347	+ 8.4	354	+ 8.3	358	+ 8.5
Distillate	2,985	+ 0.8	2,960	+ 1.6	3,365	+ 5.0	2,805	− 0.6	2,650	− 1.7	3,120	+ 0.1
Dist. 1-4	2,591	+ 0.9	2,568	+ 1.7	2,993	+ 5.6	2,413	− 0.8	2,243	− 2.1	2,715	—
Dist. 5	394	+ 0.5	392	+ 0.5	372	+ 0.5	392	+ 0.5	407	+ 0.5	405	+ 0.5
Residual	1,200	− 5.5	1,270	−10.4	1,315	− 5.0	1,145	− 1.5	1,130	− 9.8	1,210	− 5.5
Dist. 1-4	971	− 6.0	1,033	− 8.8	1,095	− 5.4	910	− 1.0	902	−11.3	977	− 6.0
Dist. 5	229	− 3.4	237	−16.8	220	− 3.1	235	− 3.7	228	− 3.4	233	− 3.3
LPG and ethane	1,630	+ 0.9	1,615	+ 6.8	1,805	+ 1.1	1,410	+ 1.0	1,525	+ 0.9	1,780	+ 0.7
Dist. 1-4	1,548	+ 0.9	1,534	+ 5.3	1,717	+ 1.1	1,332	+ 1.0	1,449	+ 0.9	1,694	+ 0.7
Dist. 5	82	+ 1.2	81	+47.3	88	+ 1.1	78	+ 1.3	76	+ 1.3	86	+ 1.2
Other products	2,200	+ 1.6	2,165	+ 3.3	1,950	+ 1.8	2,345	+ 1.7	2,485	+ 1.3	2,020	+ 1.7
Dist. 1-4	1,863	+ 1.6	1,834	+ 3.2	1,657	+ 1.7	1,991	+ 1.3	2,121	+ 1.3	1,683	+ 2.1
Dist. 5	337	+ 1.8	331	+ 3.8	293	+ 2.1	354	+ 3.8	364	+ 1.7	337	− 0.3
TOTAL DOMESTIC DEMAND	**16,660**	**+ 0.7**	**16,540**	**+ 1.6**	**16,640**	**+ 1.7**	**16,520**	**+ 0.5**	**16,690**	**+ 0.4**	**16,790**	**+ 0.2**
Dist. 1-4	13,991	+ 0.6	13,914	+ 1.5	14,101	+ 1.7	13,803	+ 0.3	13,933	+ 0.2	14,127	—
Dist. 5	2,669	+ 1.6	2,626	+ 1.9	2,539	+ 1.8	2,717	+ 1.8	2,757	+ 1.6	2,663	+ 1.3
EXPORTS	**750**	**− 0.7**	**755**	**− 3.8**	**790**	**− 0.9**	**740**	**+ 1.6**	**710**	**+ 0.1**	**760**	**+ 3.7**
Dist. 1-4	340	− 0.9	343	− 8.5	390	− 1.0	310	+ 3.7	320	− 2.7	340	− 2.9
Dist. 5	410	− 0.5	412	+ 0.5	400	−12.1	430	—	390	+ 2.6	420	+ 9.7
TOTAL DEMAND	**17,410**	**+ 0.7**	**17,295**	**+ 1.3**	**17,430**	**+ 1.3**	**17,260**	**+ 0.6**	**17,400**	**+ 0.4**	**17,550**	**+ 0.3**
Dist. 1-4	14,331	+ 0.5	14,257	+ 1.3	14,491	+ 1.6	14,113	− 2.5	14,253	+ 0.1	14,467	− 0.1
Dist. 5	3,079	+ 1.3	3,038	+ 1.7	2,939	− 0.3	3,147	+ 1.5	3,147	+ 1.7	3,083	+ 2.4
SUPPLY												
Crude & condensate	8,150	− 1.8	8,300	− 4.4	8,250	− 1.4	8,175	− 1.7	8,125	− 0.8	8,050	− 3.2
Dist. 1-4	5,050	− 3.8	5,251	− 7.7	5,150	− 3.6	5,075	− 3.5	5,025	− 3.4	4,950	− 4.8
Dist. 5	3,100	+ 1.7	3,049	+ 2.0	3,100	+ 2.4	3,100	+ 1.3	3,100	+ 3.6	3,100	− 0.6
NGL and other hydrocar.	1,635	− 1.2	1,655	+ 2.9	1,655	− 1.4	1,635	− 0.7	1,615	− 2.0	1,635	− 0.8
Dist. 1-4	1,549	− 1.1	1,566	+ 0.6	1,568	− 2.3	1,550	− 0.6	1,530	− 1.2	1,548	− 0.1
Dist. 5	86	− 3.4	89	+71.2	87	+19.2	85	− 1.2	85	−14.1	87	−11.2
IMPORTS												
Crude	4,855	+ 5.7	4,595	+11.3	4,305	+ 9.5	4,775	+10.8	5,315	+ 2.1	5,025	+ 1.8
Dist. 1-4	4,655	+ 5.8	4,401	+11.6	4,110	+10.0	4,575	+11.1	5,110	+ 2.0	4,825	+ 1.8
Dist. 5	200	+ 3.1	194	+ 3.7	195	+ 0.5	200	+ 3.6	205	+ 6.2	200	+ 2.0
Products and unfinished	1,950	+ 3.4	1,885	− 7.7	1,880	+ 0.2	1,900	+ 7.8	2,005	—	2,015	+ 6.3
Dist. 1-4	1,865	+ 3.0	1,811	− 5.4	1,793	− 0.4	1,819	+ 6.9	1,919	− 0.5	1,929	+ 6.3
Dist. 5	85	+14.9	74	− 42.6	87	+ 14.5	81	+30.6	86	+10.3	86	+ 7.5
TOTAL IMPORTS	**6,805**	**+ 5.0**	**6,480**	**+ 5.0**	**6,185**	**+ 8.5**	**6,675**	**+ 9.8**	**7,320**	**+ 1.5**	**7,040**	**+ 3.1**
Dist. 1-4	6,520	+ 5.0	6,212	+ 6.1	5,903	+ 6.6	6,394	+ 9.9	7,029	+ 1.3	6,754	+ 3.1
Dist. 5	285	+ 6.3	266	−15.2	282	+ 4.4	281	+10.2	291	+ 7.4	286	+ 3.6
Processing gain, loss, etc.	835	+ 0.6	830	+ 9.9	850	− 4.3	865	− 7.3	780	− 3.7	845	+22.6
Dist. 1-4	652	+ 0.8	647	+ 4.2	570	− 4.0	675	− 1.2	610	− 6.3	653	+17.4
Dist. 5	183	—	183	+36.6	180	− 5.3	190	−24.0	170	+ 6.9	192	+44.4
TOTAL NEW SUPPLY	**17,425**	**+ 0.9**	**17,265**	**+ 0.3**	**16,940**	**+ 1.2**	**17,350**	**+ 2.2**	**17,840**	**− 3.1**	**17,570**	**+ 0.5**
Dist. 1-4	13,771	+ 0.7	13,676	− 0.4	13,291	+ 0.8	13,694	+ 2.8	14,194	− 1.0	13,905	+ 0.3
Dist. 5	3,654	+ 1.8	3,589	+ 2.8	3,649	+ 2.5	3,656	+ 0.1	3,646	+ 3.6	3,665	+ 1.1
STOCK CHANGE	**15**	**—**	**(30)**	**—**	**(490)**	**—**	**90**	**—**	**440**	**—**	**20**	**—**
Dist. 1-4	(560)	—	(581)	—	(1,200)	—	(419)	—	(59)	—	(562)	—
Dist. 5	575	—	551	—	710	—	509	—	499	—	582	—
CRUDE RUNS TO STILLS	**12,925**	**+ 0.7**	**12,840**	**+ 1.0**	**12,495**	**+ 1.2**	**12,805**	**+ 0.8**	**13,285**	**− 0.3**	**13,065**	**+ 1.0**
TOTAL INPUT TO STILLS	**13,035**	**+ 0.7**	**12,940**	**+ 0.8**	**12,575**	**+ 1.3**	**13,005**	**+ 0.9**	**13,385**	**− 0.3**	**13,165**	**+ 1.1**
TOTAL REFINING CAPACITY	**15,700**	**+ 0.2**	**15,673**	**+ 1.2**	**15,700**	**+ 0.4**	**15,700**	**+ 0.2**	**15,700**	**+ 0.1**	**15,700**	**—**
REFINING UTILIZATION (%)	**83.0**	**+ 0.5**	**82.6**	**− 0.2**	**80.1**	**+ 1.4**	**82.8**	**+ 1.0**	**85.3**	**− 0.8**	**83.8**	**+ 1.0**
TOTAL INDUSTRY STOCKS†	**1,075**	**+ 0.5**	**1,070**	**− 1.0**	**1,025**	**− 1.8**	**1,033**	**+ 0.8**	**1,073**	**− 0.2**	**1,075**	**+ 0.5**
Products	735	+ 2.8	715	− 4.7	700	− 1.1	703	+ 1.2	733	− 0.4	735	+ 2.8
Crude	340	− 4.2	355	+ 7.3	325	− 2.5	330	+ 0.1	340	+ 0.4	340	− 4.2
SPR stocks†	565	+ 4.6	540	+ 5.5	546	+ 5.0	525	+ 4.7	559	+4.7	565	+ 4.6

*Preliminary estimate. †Million bbl at end of period.

to 16.465 quads in 1987, the lowest level since 1965.

Natural gas consumption is expected to increase slightly to 16.54 quads in 1988, but market share will drop to 21.8%.

Natural gas consumption data may be understated. There is some evidence that new producer marketing strategies may be bypassing the data gathering of the Energy Information Administration. The amount of unaccounted for gas in the EIA natural gas balance has jumped substantially.

Coal consumption increased 2.1% last year to 17.625 quads, and accounted for 23.5% of the energy market.

Coal consumption is expected to move up a marginal 0.3% in 1988 to 17.68 quads, but market share will slip due to increased competition from lower priced natural gas.

Nuclear power is expected to gain another 7.2% in 1988 to 5.3 quads. In 1988 nuclear power will provide 7% of total energy; it now provides over 17% of U.S. electricity generation.

Hydroelectric and geothermal power consumption will rebound in 1988 to 3.6 quads, up 4.2%.

Petroleum demand

When prices stabilized during 1987, the rate of growth in demand for petroleum products slowed. But since prices stabilized at a level lower than the 1980-85 period, demand continued to expand.

Combined with continued economic growth this boosted total domestic demand for petroleum products 1.6% to 16.54 million b/d, the highest level since 1980.

This same combination of modest prices and economic growth is expected to push up demand again in 1988. But the rate of growth will be only 0.7% to 16.66 million b/d.

Modest increases in demand are expected this year for all major product categories except residual fuel oil. Total demand including exports will be up 0.7% to 17.41 million b/d. Exports should average 750,000 b/d compared with 755,000 b/d in 1987. Last year crude exports averaged 154,000 b/d and product exports averaged 601,000 b/d. Major product exports were coke, 221,000 b/d, and residual fuel oil, 176,000 b/d.

Domestic demand for petroleum products dropped for 5 consecutive years from the peak of 18.847 million b/d in 1978 to 15.231 million b/d in 1983. Since that time, demand has been gradually increasing.

Oil energy consumed per dollar of GNP has fallen from 12,500 BTU in 1977 to 8,600 BTU in 1987.

This ratio is expected to fall to 8,400 BTU in 1988.

Prices

	Crude oil		Products		Natural gas	
Year	Average U.S. wellhead price ($/bbl)	Average landed cost of imports ($/bbl)	Unleaded gasoline pump price (¢/gal)	No. 2 fuel oil wholesale price (¢/gal)	Average U.S. wellhead price ($/Mcf)	Average consumer price ($/Mcf)
1976	8.19	13.34	61.4	N.A.	0.58	1.47
1977	8.57	14.31	65.6	N.A.	0.79	1.78
1978	9.00	14.38	67.0	36.9	0.91	1.98
1979	12.64	21.65	90.3	56.9	1.18	2.34
1980	21.59	33.95	124.5	80.3	1.59	2.91
1981	31.77	36.52	137.8	97.6	1.98	3.51
1982	28.52	33.18	129.6	91.4	2.46	4.32
1983	26.19	28.93	124.1	81.5	2.59	4.82
1984	25.88	28.46	121.2	82.1	2.66	4.85
1985	24.09	26.66	120.2	77.6	2.51	4.72
1986	12.66	13.42	92.7	48.7	1.94	4.13
1987*	15.65	17.85	95.3	53.3	1.78	3.63

*Estimated.
Source: 1976-86, DOE; 1987 OGJ estimates

U.S. energy efficiency

Year	GNP (Billion 1982 dollars)	Energy consumption (Trillion BTU)	Energy consumption per GNP 1982 dollar (Thousand BTU)	Oil energy consumption (Trillion BTU)	Oil energy consumption per GNP 1982 dollar (Thousand BTU)
1970	2,416	67,143	27.8	29,537	12.2
1971	2,485	68,348	27.5	30,570	12.3
1972	2,609	71,643	27.5	32,966	12.6
1973	2,744	74,282	27.1	34,840	12.7
1974	2,729	72,543	26.6	33,455	12.3
1975	2,695	70,545	26.2	32,731	12.1
1976	2,827	74,362	26.3	35,175	12.4
1977	2,959	76,289	25.8	37,122	12.5
1978	3,115	78,089	25.1	37,965	12.2
1979	3,192	78,897	24.7	37,123	11.6
1980	3,187	75,955	23.8	34,202	10.7
1981	3,249	73,991	22.8	31,931	9.8
1982	3,166	70,838	22.4	30,231	9.5
1983	3,279	70,500	21.5	30,054	9.2
1984	3,501	74,064	21.2	31,051	8.9
1985	3,608	73,964	20.5	30,922	8.6
1986	3,713	74,253	20.0	32,178	8.7
1987*	3,813	75,150	19.7	32,660	8.6
1988†	3,900	76,010	19.5	32,890	8.4

*Estimated. †Forecast.
Source: 1970-86 DOE; 1987 and 1988 OGJ estimates

Products breakout

Motor gasoline demand increased 1.9% to 7.165 million b/d in 1987 and is projected to increase another 0.8% to 7.22 million b/d this year.

This would make 1988 the second highest year on record; demand peaked at 7.412 million b/d in 1978.

The vehicle fleet has grown and the average miles driven per vehicle has also increased. These same factors will boost gasoline demand in 1988.

The average miles traveled per gallon of fuel has increased from 13.3 in 1973 to 18.32 in 1986, an increase of 37.7%. This ratio is forecast to reach 18.78 mpg in 1988.

The retail price for all grades of gasoline fell from an average of $1.353/gal in 1981 to 93.1¢/gal in 1986, then returned to an estimated 95.7¢/gal in 1987. Total jet fuel demand is projected to increase 4.4% in 1988 to 1.425 million b/d following a similar 4.4% increase in 1987. All of this year's increase will be in demand for kerosine jet fuel used in commercial aviation. Demand for naphtha jet fuel used for military jets is expected to remain at 210,000 b/d.

Demand for commercial jet fuel gained 4.5% in 1987 and is expected to increase another 5.2% this year to 1.215 million b/d. Continued intense competition is expected to keep fares relatively low, increase flights, and boost fuel demand. And improved fuel efficiency from new equipment is expected to slow in 1988.

Distillate demand is expected to grow a modest 0.8% in 1988 to 2.985 million b/d; demand in 1986 averaged 2.96 million b/d.

The bulk of this year's increase will

Crude imports by country of origin*

	1987†	1986	1985	1984	1983	1982	1981	1980	1979	1978
	1,000 b/d									
Algeria§	95	78	84	195	176	90	261	456	608	634
Angola	162	102	104	85	71	42	45	37	39	6
Australia	53	30	21	25	0	0	0	0	0	0
Canada	633	570	468	341	274	214	164	199	271	248
China	72	68	36	15	6	8	0	0	13	0
Colombia	107	57	0	0	0	0	0	0	0	0
Congo	13	20	16	33	18	1	3	7	2	15
Ecuador§	20	64	56	47	56	32	38	17	30	38
Gabon§	41	25	51	57	59	40	35	25	42	38
Indonesia§	271	297	292	304	315	226	318	314	380	533
Iran§	106	19	27	10	48	35	0	8	297	554
Iraq§	78	81	46	12	10	3	0	28	88	62
Libya§	0	0	0	0	0	23	317	548	642	638
Malaysia	9	11	1	0	3	18	33	61	52	37
Mexico	630	621	715	659	766	645	469	507	435	316
Nigeria§	517	437	280	207	301	510	611	841	1,069	910
Norway	77	53	31	112	65	102	114	144	75	104
Oman	24	8	2	10	34	22	24	24	37	61
Peru	1	9	12	1	8	21	30	40	40	19
Saudi Arabia§	633	618	132	309	321	530	1,112	1,250	1,347	1,142
Trinidad & Tobago	86	93	98	87	83	92	102	115	123	142
United Arab Emirates§	56	38	35	90	18	81	77	172	281	385
United Kingdom	330	317	278	378	365	441	369	173	197	169
Venezuela§	503	416	306	253	164	155	147	156	293	181
Zaire	20	26	34	31	22	19	16	13	4	1
Others	134	121	77	164	145	139	111	127	156	122
Total imports	**4,670**	**4,178**	**3,201**	**3,426**	**3,329**	**3,488**	**4,396**	**5,263**	**6,519**	**6,356**
Total from OPEC	**2,365**	**2,113**	**1,320**	**1,512**	**1,477**	**1,696**	**2,922**	**3,864**	**5,112**	**5,184**

*Includes imports for the Strategic Petroleum Reserve. †Preliminary. §OPEC member.

Imports of refined products

	1987*	1986	1985	1984	1983	1982	1981	1980	1979	1978
	1,000 b/d									
Gasoline	363	326	381	299	247	197	157	140	181	190
Kerosine	15	13	8	12	11	13	7	10	9	11
Jet fuel-kerosine	33	48	30	47	29	23	31	49	55	67
Jet fuel-naphtha	5	9	9	14	1	5	7	31	22	19
Distillate	237	247	200	272	174	93	173	142	196	173
Residual	562	669	510	682	699	776	800	941	1,150	1,355
Unfinished oils	273	250	318	231	234	174	112	55	56	27
Other†	397	483	411	459	327	344	312	283	264	165
Total U.S.	**1,885**	**2,045**	**1,866**	**2,016**	**1,722**	**1,625**	**1,599**	**1,651**	**1,933**	**2,007**

*Preliminary. †Includes plant condensate.

Exports of refined products and crude

	1987*	1986	1985	1984	1983	1982	1981	1980	1979	1978
	1,000 b/d									
Gasoline	34	33	10	6	10	20	2	1	1	2
Distillate	70	100	67	51	64	74	5	3	4	3
Residual	176	147	197	191	185	209	118	34	9	13
Lubricants	24	23	15	15	16	16	19	23	24	27
Coke	221	238	187	194	195	156	138	137	146	111
Asphalt and road oil	1	1	0	1	1	1	—	1	—	1
LPG	33	42	62	48	73	65	42	21	15	20
Other refined products	42	47	38	36	31	38	43	39	39	27
Total refined products	601	631	577	542	575	579	367	259	238	204
Crude	154	154	204	181	164	236	228	287	234	158
Total exports	**755**	**785**	**781**	**723**	**739**	**815**	**595**	**546**	**472**	**362**

*Preliminary.

be in demand for highway diesel.

Demand from other sectors is expected to remain relatively constant.

The wholesale price of No.2 fuel oil moved up 9.4% to 53.3¢/gal in 1987 and could gain another 5% this year. But the price is still far below the peak of 97.6¢/gal in 1981.

After a 1-year surge, demand for residual fuel oil resumed its downward trend in 1987. Resid demand fell 10.4% to 1.27 million b/d. In 1986 low prices made resid more competitive and demand jumped 18% to 1.418 million b/d.

Demand is expected to fall again in 1988, dropping 5.5% to 1.2 million b/d, the lowest level since 1942.

Resid demand peaked in 1977 at 3.071 million b/d and then declined to 1.202 million b/d in 1985.

Demand for LP-gas and ethane rebounded in 1987, increasing 6.8% to 1.615 million b/d. Demand is expected to grow only 0.9% to 1.63 million b/d in 1988. Demand for all other products increased 3.3% in 1987 to 2.165 million b/d and is projected to increase an additional 1.6% to 2.2 million b/d in 1988.

U.S. production of crude oil and lease condensate

	1987*	1986	1985	1984	1983	1982	1981	1980	1979	1978	Cumulative 1859-1987
	1,000 b/d										1,000 bbl
District 1:											
Fla., N.Y., Pa., W. Va.	42	47	57	63	77	93	117	133	149	145	2,813,444
Total Dist. 1	42	[illegible]	[illegible]	63	77	93	117	133	149	145	2,813,444
District 2:											
Illinois	65	[illegible]	83	79	80	76	66	62	60	63	[illegible]
Indiana	11	13	14	15	15	15	13	14	11	13	[illegible]
Kansas	161	[illegible]	207	[illegible]	196	193	181	164	156	153	[illegible]
Kentucky	16	18	21	21	22	20	18	16	16	19	[illegible]
Michigan	65	[illegible]	75	83	87	[illegible]	89	92	93	92	[illegible]
Nebraska	17	[illegible]	19	[illegible]	17	19	18	17	17	16	[illegible]
North Dakota	115	[illegible]	139	144	139	129	124	110	84	64	[illegible]
Ohio	35	37	41	43	41	40	37	35	35	34	[illegible]
Oklahoma	364	[illegible]	[illegible]	460	435	[illegible]	422	410	393	418	[illegible]
Others	6	[illegible]	7	8	7	7	7	4	[illegible]	4	[illegible]
Total Dist. 2	855	[illegible]	[illegible]	1,077	[illegible]	[illegible]	978	[illegible]	[illegible]	[illegible]	[illegible]
District 3:											
Alabama	57	[illegible]	59	54	51	[illegible]	57	61	52	53	[illegible]
Arkansas	39	[illegible]	52	[illegible]	52	52	50	50	52	56	[illegible]
Louisiana	1,312	[illegible]	[illegible]	1,408	1,314	[illegible]	1,221	[illegible]	[illegible]	[illegible]	[illegible]
Mississippi	76	[illegible]	84	90	[illegible]	[illegible]	94	[illegible]	[illegible]	[illegible]	[illegible]
New Mexico	192	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Texas	2,131	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Dist. 3	3,807	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
District 4:											
Colorado	75	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Montana	70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Utah	95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wyoming	307	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Dist. 4	547	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
District 5:											
Alaska	1,948	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
California	1,093	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	(s)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total Dist. 5	3,049	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
U.S. total	8,300	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible] and demand [illegible] in the U.S.

[illegible]	[illegible]
[illegible]	4,670
[illegible]	8,300
[illegible]	205
[illegible]	13,175
[illegible]	12,840
[illegible]	40
[illegible]	154
[illegible]	75
[illegible]	13,109
[illegible]	66
[illegible]	355
[illegible]	540

[illegible]

Fig. 1

Crude output drop continues

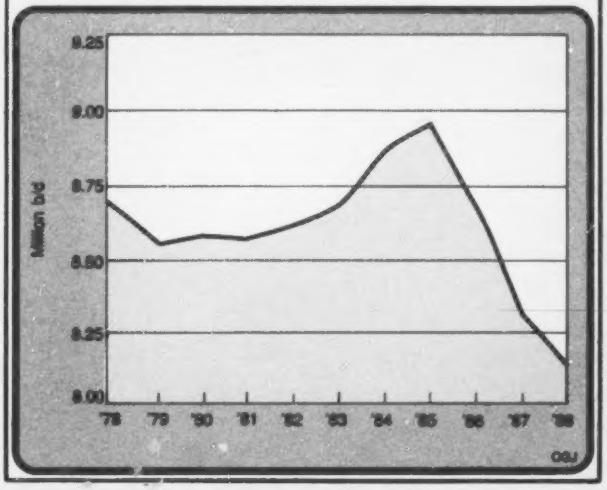


Fig. 2

Motor gasoline demand up

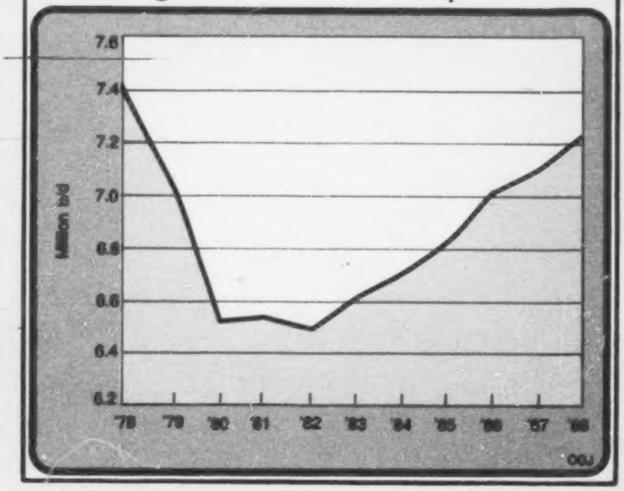


Fig. 3

Crude imports keep climbing

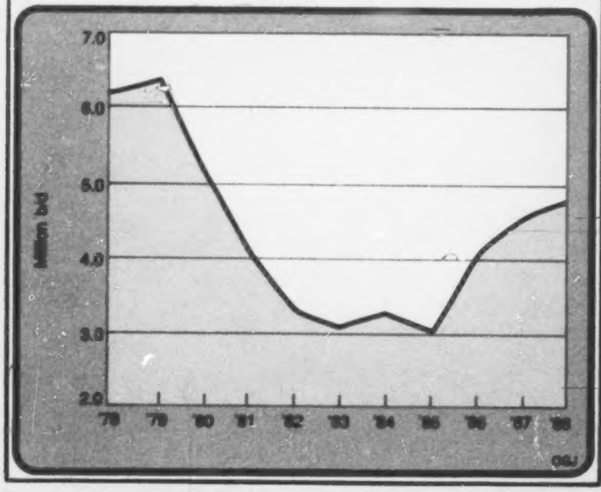


Fig. 4

Distillate demand to rise

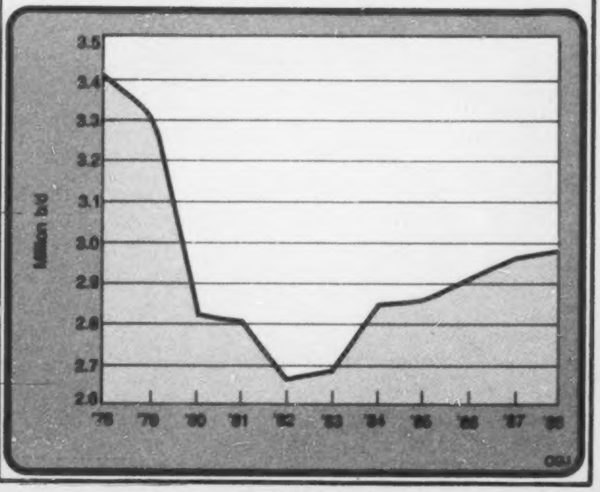


Fig. 5

Rig activity fall will reverse

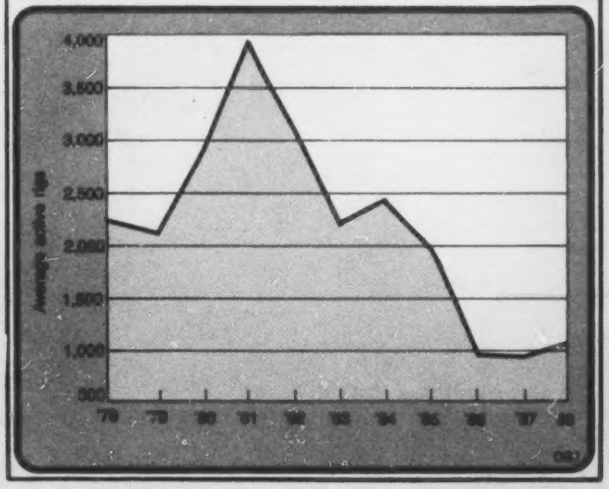
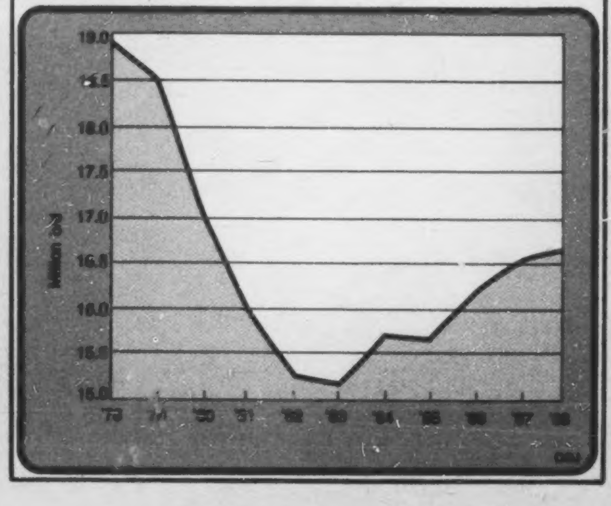


Fig. 6

Gain in total demand slows



Rotary rig activity by states

	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978
Alabama	10.6	10.3	22.3	15.5	16.4	15.4	17.3	10.8	12.6	12.5
Alaska	8.5	12.8	20.0	14.0	13.8	21.6	23.5	13.8	13.5	15.5
Arizona	0.2	0.0	0.2	0.2	0.3	1.0	1.1	1.0	0.0	0.4
Arkansas	9.1	9.6	24.0	26.3	25.9	27.0	33.9	26.8	10.4	13.9
California	60.9	49.1	80.0	106.8	105.9	128.7	154.9	120.2	95.6	94.1
Land	54.6	43.8	68.3	88.8	83.7	106.2	133.7	104.7	85.7	86.4
Offshore	6.3	5.3	11.7	18.0	22.3	22.6	21.1	15.5	9.9	7.8
Colorado	24.8	24.3	49.8	53.9	52.3	60.3	81.6	61.1	40.2	41.1
Florida	2.8	2.2	6.7	3.7	4.4	4.6	7.8	4.1	5.3	6.3
Idaho	0.4	1.0	1.3	0.8	1.2	1.5	3.2	2.6	1.8	3.2
Illinois	3.4	5.6	28.4	41.5	60.5	75.5	44.6	25.4	13.1	26.0
Indiana	0.5	1.2	3.6	6.4	5.9	7.1	1.2	0.1	0.3	4.4
Kansas	48.5	46.8	91.4	127.1	124.5	157.4	196.2	120.2	62.5	75.6
Kentucky	2.0	2.5	6.3	7.9	8.3	9.5	5.3	1.7	0.5	3.3
Louisiana	134.7	142.1	282.2	309.9	282.3	342.8	455.6	427.4	347.0	338.3
North	11.4	11.3	24.5	30.1	29.6	39.6	58.0	54.9	34.5	39.8
Inland waters	22.9	41.8	85.4	96.1	81.6	107.8	83.2	76.6	62.1	62.5
South	35.4	20.2	43.4	51.2	47.3	59.2	160.3	156.4	112.3	113.9
Offshore	64.9	68.8	129.0	132.5	123.8	136.3	154.1	139.4	138.2	122.1
Michigan	21.8	24.0	33.5	34.0	29.2	31.4	36.5	30.7	25.1	24.0
Mississippi	13.1	15.3	30.8	32.0	32.8	41.6	71.5	57.6	40.2	44.5
Montana	8.5	9.7	22.7	36.0	23.8	36.2	81.4	49.2	32.9	30.1
Nebraska	5.2	3.1	6.4	8.9	9.0	9.4	15.1	14.3	9.2	9.6
Nevada	1.5	2.9	4.9	4.8	1.1	3.0	4.9	4.6	4.1	2.9
New Mexico	34.6	29.0	71.1	78.0	65.3	103.3	134.9	117.6	87.5	75.5
New York	2.0	2.2	4.8	8.8	10.3	15.2	11.6	7.0	8.7	7.0
North Dakota	14.1	13.3	38.3	50.9	42.3	69.4	118.8	83.4	56.5	39.1
Ohio	19.6	17.5	28.8	51.0	39.7	56.8	97.8	73.7	46.3	45.6
Oklahoma	136.1	141.2	251.3	319.1	285.4	621.5	698.4	397.3	246.8	258.2
Pennsylania	17.4	17.9	29.5	35.2	22.1	32.6	38.6	29.0	28.9	25.2
South Dakota	0.4	0.6	1.7	2.1	1.0	1.5	2.2	1.9	1.4	2.3
Texas	293.0	310.9	676.6	849.5	797.0	989.5	1,315.8	987.7	770.2	855.1
Gulf Coast	42.4	44.5	101.3	137.9	134.3	168.4	305.0	210.5	141.3	138.7
Offshore & inland waters	19.8	21.7	51.5	59.8	56.3	88.4	74.4	72.1	50.3	46.9
North	23.8	36.5	86.9	124.4	125.0	138.1	170.6	147.2	122.5	153.2
Panhandle	16.8	16.0	37.2	49.6	48.4	66.2	66.5	50.8	48.1	60.4
East	36.2	45.4	77.2	101.8	102.2	116.5	163.7	119.8	107.1	116.6
West Central	44.8	41.7	81.8	99.7	102.6	139.4	191.4	140.4	109.4	124.7
West	109.3	105.1	240.7	276.4	228.2	272.5	344.3	247.1	191.7	214.5
Utah	7.4	11.1	28.5	45.5	36.7	39.8	69.2	42.4	28.9	32.1
West Virginia	12.6	15.0	26.1	37.9	34.2	49.4	44.8	7.8	29.8	27.1
Wyoming	39.3	35.4	92.1	114.5	95.8	142.7	191.3	155.5	147.2	136.4
Others	3.1	6.9	4.9	5.2	4.5	6.7	9.1	2.7	3.7	2.8
Total U.S.	935.8	963.5	1,968.5	2,428.3	2,232.3	3,104.8	3,969.5	2,910.3	2,177.2	2,258.4
Canada-land	179.3	174.8	302.1	242.8	189.5	195.0	256.7	396.4	334.6	270.2
Canada-offshore	2.0	4.1	9.1	13.5	10.4	5.4	4.8	4.7	4.1	1.5
Grand total	1,117.1	1,142.5	2,278.7	2,684.6	2,432.2	3,306.3	4,232.9	3,311.4	2,515.9	2,530.2

Source: Baker Hughes Inc.
Note: May not add due to independent rounding.

Marketed natural gas production*

	1987†	1986	1985	1984	1983	1982	1981	1980	1979	1978
					MMcfd					
Alabama	321	294	294	278	249	205	217	178	235	235
Alaska	970	835	880	792	758	698	664	632	605	556
Arkansas	365	359	425	370	349	253	260	306	300	293
California	1,210	1,266	1,346	1,305	1,137	1,001	1,009	849	680	852
Colorado	421	448	488	474	448	576	527	523	523	503
Kansas	1,056	1,276	1,405	1,277	1,191	1,177	1,754	2,014	2,186	2,341
Louisiana	13,767	13,412	13,736	15,959	14,609	16,798	18,557	19,013	19,907	20,483
Michigan	442	349	361	395	381	419	418	433	438	405
Mississippi	398	386	396	433	414	554	570	508	395	292
New Mexico	2,115	1,925	2,480	2,623	2,453	2,732	3,078	3,150	3,237	3,217
Ohio	490	499	499	510	415	379	387	379	338	313
Oklahoma	5,346	5,253	5,305	5,440	4,739	5,300	5,531	5,183	5,028	4,859
Pennsylvania	435	438	412	454	324	332	335	266	264	268
Texas	16,575	16,854	16,583	16,945	16,270	17,802	19,205	19,868	19,657	17,940
W. Virginia	340	371	397	394	356	416	440	429	412	407
Wyoming	1,344	1,105	1,141	1,416	1,216	1,503	1,503	1,122	1,135	979
Others	952	932	970	879	779	594	218	597	437	493
Total	46,548	46,003	47,118	49,944	46,088	50,739	54,673	55,450	55,777	54,436
Volume change	545	(1,115)	(2,826)	3,856	(4,651)	(3,935)	(777)	(327)	1,341	(133)
Percent change	1.2	– 2.4	– 5.7	8.4	– 9.2	– 7.2	– 1.4	– 0.6	2.5	– 0.2
Imports	2,356	2,049	2,603	1,762	2,515	2,556	2,477	2,699	2,434	2,645
Exports	164	167	151	150	150	142	162	134	153	144

*Includes nonhydrocarbon gases. †Preliminary.

OPEC production policy key to industry's future

The timing and extent of the worldwide petroleum industry's return to normal activity levels hinge on crude prices.

And crude price levels—and stability—depend on OPEC's production policy.

Because of its aggressive pricing policy in the late 1970s and early 1980s OPEC became the "supplier of last resort."

OPEC production is called upon only after consuming countries have used their own output, and non-OPEC supplies have been fully committed.

OPEC members have been supplying a dwindling share of world oil needs, and conservation efforts have lowered total world consumption.

Now OPEC has considerable excess producing capacity, and production must be restricted if the price is to stabilize. When member countries try to market substantially more than is needed to meet demand, refiners bid down the price and build stocks for future consumption.

The industry has learned that there is no economic floor to oil prices in the short run.

Average prices for export crudes in 1986 dropped as low $9.35/bbl, and some were selling below $9/bbl.

Only the willingness of OPEC members to establish production quotas brought prices back to the $17-18/bbl level that existed for most of 1987.

Production restraint during the first half of 1987 held oil production to 16.3 million b/d. This enabled the world market to work off excess inventories while keeping the price level stabilized above $17/bbl.

However, during the second half of the year, several OPEC countries exceeded their quotas, and refiners responded by building up stocks with lower-priced crude.

According to the International Energy Agency (IEA), OPEC crude production averaged 19.1 million b/d during the third quarter of 1987, far exceeding the 16.6 million b/d quota.

Overproduction continued through the fourth quarter averaging 18.8 million b/d.

The average world price of OPEC export crude slipped from a 1987 high of $17.53/bbl the week of Aug. 7 to $17.09/bbl the week of Dec. 11, according to the U.S. Energy Information Administration.

The failure of the OPEC members to accept quota discipline at the December meeting led to increased price volatility. The willingness of OPEC to restrain production will be thoroughly tested during early 1988.

Demand. The IEA estimates that the demand for oil from other than non-OPEC supplies will be approximately 21.9 million b/d during the first quarter of 1988. Assuming stock levels are reduced about 3 million b/d, the same as first quarter 1987, the demand for OPEC crude and NGL will fall to 19.9 million b/d.

With OPEC NGL output averaging 1.7 million b/d, demand for OPEC crude is reduced to 17.2 million b/d, far below the present production of close to 19 million b/d.

Assuming no stock reduction, demand for OPEC crude oil, according to IEA data, will be only 16.9 million b/d during second quarter 1988.

If OPEC is to stabilize prices in the $17-18/bbl range, members will have to adhere to production quotas that total 1.8-2 million b/d below existing production.

Demand for OPEC oil

	Estimate		Projection	
	3rd Qtr. 1987	4th Qtr. 1987	1st Qtr. 1988	2nd Qtr. 1988
	(Million b/d)			
Non-Communist demand	48.4	49.7	50.2	47.3
Non-OPEC supply	29.1	28.4	28.3	28.7
OPEC supply:				
Crude oil	19.1	18.8	17.2	16.9
NGL	1.7	1.7	1.7	1.7
Total OPEC	**20.8**	**20.5**	**19.9**	**18.6**
Total supply	**49.9**	**48.9**	**47.2**	**47.3**
Stock change	**+ 1.5**	**+0.8**	**−3.0**	**—**

Source: Non-Communist demand, non-OPEC supply, OPEC supply 3rd and 4th qtr 1987—and stock change 3rd and 4th qtr 1987—International Energy Agency. Projections of OPEC supply 1st and 2nd qtr 1988 and stock change, 1st and 2nd qtr 1988 — Oil & Gas Journal

Refining and stocks

Last year, refiners continued to operate at minimum stock levels. Industry stocks were reduced by an estimated 11 million bbl last year, dropping to 1.07 billion bbl.

Product stocks were reduced by 35 million bbl to 715 million bbl, but crude stocks were increased by 24 million bbl to 355 million bbl.

In 1988, product stocks are expected to move up 20 million bbl to 735 million bbl and crude stocks will be drawn down to 340 million bbl. Refiners have been holding crude stocks close to this level for the past 8 years.

Refinery crude runs will increase this year to match the increase in demand, gaining 0.7% to 12.925 million b/d. The refinery utilization rate in 1987 was 82.6% compared to 82.8% in 1986. Average refining capacity increased 179,000 b/d to 15.673 million b/d for 1987.

Refining capacity was 15.7 million b/d at year end 1987 and is not expected to increase in 1988.

With slightly increased input, the average utilization rate is forecast at 83% for the year.

Imports

The increase in crude and products imports will continue in 1988.

Oil & Gas Journal projects a 5% increase in total imports in 1988, excluding crude imports for the Strategic Petroleum Reserve (SPR). The total will reach 6.805 million b/d this year, an increase of 325,000 b/d.

Imports accounted for only 31.5% of total domestic demand in 1985, but this share jumped to 37.9% in 1986 and an estimated 39.2% in 1987. U.S. dependency on foreign oil will reach 40.8% this year, the highest since 1979. Imports accounted for 47.7% of total demand in 1977.

Crude imports (excluding SPR) are forecast to gain 5.7% to 4.855 million b/d in 1988, following an 11.3% increase to 4.595 million b/d last year.

Crude imports were only 3.083 million b/d in 1985.

Imports for the SPR are expected to continue at close to the present level of 65,000-70,000 b/d in 1988.

Product imports fell 7.7% last year to 1.885 million b/d as demand for

Refinery runs by districts

	1987			Crude runs								
	Crude runs*	Input to crude stills*	% of operable capacity	1986	1985	1984	1983	1982	1981	1980	1979	1978
	1,000 b/d			1,000 b/d								
East Coast	1,155	1,158	86.3	1,122	1,061	1,019	960	1,103	1,202	1,300	1,478	1,537
Appalachian Dist. 1	99	99	91.7	101	92	87	77	93	132	158	167	180
Total Dist. 1	1,254	1,257	86.7	1,223	1,153	1,106	1,037	1,196	1,334	1,458	1,645	1,717
Ill., Ind., Ky.†	1,933	1,941	86.8	1,901	1,837	1,842	1,851	1,765	1,857	2,121	2,418	2,485
Minn., Wisc., Daks.	284	284	89.0	294	285	282	253	251	229	238	294	279
Okla., Kan., Mo.	635	638	87.4	627	617	636	642	763	883	945	1,017	1,044
Total Dist. 2	2,853	2,864	87.2	2,822	2,739	2,760	2,746	2,779	2,969	3,304	3,729	3,808
Texas:												
Inland	471	472	80.0	472	472	499	474	456	469	445	472	476
Gulf Coast	2,893	2,932	81.3	2,990	2,750	2,780	2,801	2,726	2,829	3,151	3,462	3,524
Louisiana Gulf	2,194	2,227	83.6	2,162	1,972	2,012	1,862	1,941	2,030	2,091	2,167	2,140
N. La., Ark.	165	165	63.0	170	168	177	170	162	163	186	200	214
New Mexico	65	66	81.5	63	60	66	75	77	81	87	89	84
Total Dist. 3	5,788	5,862	81.4	5,857	5,422	5,536	5,382	5,362	5,572	5,960	6,390	6,438
Total Dist. 4	438	438	81.6	431	432	438	420	416	425	442	477	486
Total Dist. 5	2,506	2,518	78.5	2,383	2,256	2,208	2,100	2,021	2,171	2,354	2,405	2,288
Total U.S.	12,840	12,940	82.6	12,718	12,002	12,044	11,685	11,774	12,471	13,518	14,646	14,738

*Preliminary. †Includes Appalachian Dist. 2.

U.S. refined products, natural gas liquids, and crude stocks

	1987*	1986	1985	1984	1983	1982§	1981	1980	1979	1978
	1,000 bbl									
Gasoline	227,200	235,490	225,148	246,307	225,042	247,085	256,425	264,011	240,159	240,694
Motor†	225,000	233,057	222,839	243,296	222,434	244,279	253,001	261,327	237,503	237,885
Aviation†	2,200	2,433	2,309	3,011	2,608	2,806	3,424	2,684	2,656	2,809
Special naphthas	3,600	3,759	3,909	2,951	3,153	3,474	3,965	4,929	4,196	4,071
Kerosine	8,000	8,379	7,502	11,893	7,861	10,792	11,042	11,568	16,821	14,334
Distillate	127,300	155,097	143,673	161,072	140,263	185,579	191,541	205,113	228,706	216,367
Residual	47,500	47,437	50,381	53,000	48,504	68,229	77,992	91,786	95,859	90,204
Kerosine jet fuel	43,400	42,677	33,825	35,118	32,346	32,001	34,011	35,723	32,926	27,707
Naphtha jet fuel	6,500	7,072	7,502	6,861	6,265	7,189	7,054	6,308	5,594	5,960
Natural gas liquids & LRG	114,000	109,532	81,707	108,446	116,817	114,497	150,170	137,460	125,597	134,890
Unfinished oils	95,000	94,022	106,656	93,506	108,018	105,277	111,348	123,938	117,652	108,723
Other refined products	42,500	46,658	44,258	41,192	42,429	44,023	46,295	45,426	45,274	53,053
Total products stocks	715,000	749,723	704,561	760,346	730,698	818,146	899,843	926,262	911,784	896,003
Crude stocks (ex. SPR)	355,000	331,224	320,892	345,376	343,850	350,044	363,464	358,166	339,080	309,421
Total stocks (ex. SPR)	1,070,000	1,080,947	1,025,453	1,105,722	1,074,548	1,168,190	1,263,307	1,284,428	1,250,864	1,205,424
SPR stocks	540,000	511,565	493,316	450,505	379,089	293,827	230,341	107,800	91,191	66,860
Total stocks (incl. SPR)	1,610,000	1,592,512	1,518,769	1,556,227	1,453,637	1,462,017	1,493,648	1,392,228	1,342,055	1,272,284

*Preliminary. †Includes blending components. §Change in Energy Information Administration reporting basis.

residual fuel oil dipped. But that will be reversed in 1988 with an expected gain of 3.4% to 1.95 million b/d.

Resid imports fell to 562,000 b/d in 1987, a drop of 107,000 b/d. This followed a 159,000-b/d surge in resid imports the year before as demand reacted to lower prices.

Gasoline imports moved up 37,000 b/d to 363,000 b/d in 1987.

Natural gas

Consumption of natural gas in the U.S. fell another 1.5% in 1987 to 15.985 tcf, following a drop of 6.1% in 1986 and 3.7% in 1985.

Natural gas recaptured some of the lost utility market in 1987 but commercial and industrial consumption continued to fall, according to EIA.

At the October meeting of the Independent Petroleum Association, the supply and demand committee estimated that 1987 gas production was up 0.1% from 1986.

Marketed production of natural gas increased 1.2% in 1987 to 16.99 tcf. Imports of natural gas, all from Canada, gained 14.7% to 850 bcf.

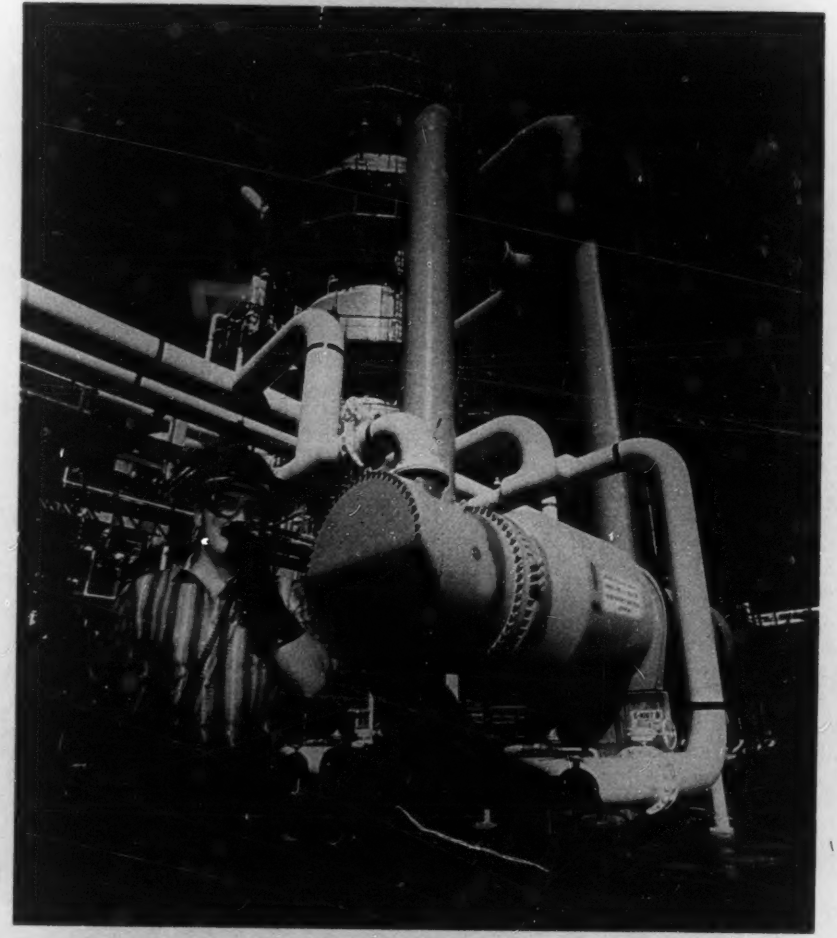
Natural gas prices have adjusted to competitive pressures from other fuels. As a result, natural gas demand is expected to grow 0.5% in 1988 to 16.065 tcf. Marketed production is projected to increase 0.1% to 17 tcf. Imports are also expected to be up 4.7% to 900 bcf.

The failure of natural gas prices to adjust rapidly to the decline in the cost of competing fuels led to the drop in demand. But natural gas prices did come down sharply at the end of 1986. The average wellhead price of natural gas fell from $2.51/Mcf in 1985 to $1.94/Mcf in 1986, and an estimated $1.78/Mcf in 1987.

Prices were firming again at the end of 1987. ■

OGJ REPORT

FORECAST
MIDYEAR
REVIEW



Gasoline demand is a bright spot in a year that so far has seen only modest improvement in upstream activity. This alkylation unit is at Amoco's Texas City refinery.

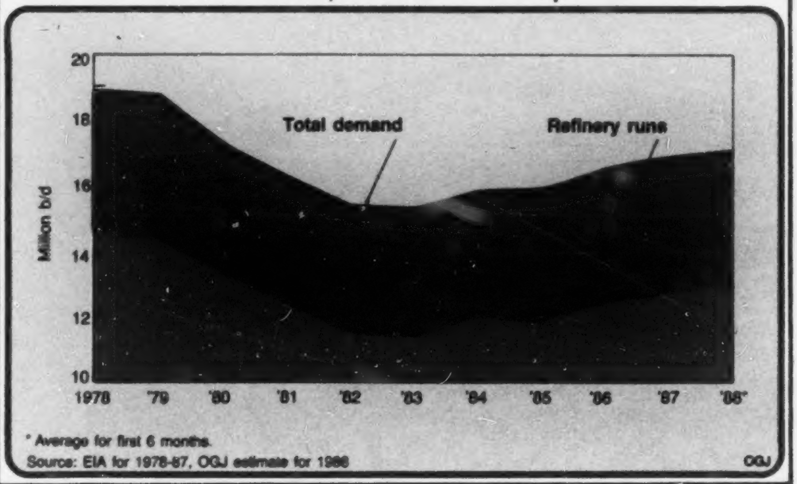
Weak prices aid 1988 demand; delay expected in upstream recovery

Robert J. Beck
Economics Editor

Lower-than-expected crude prices during the first half have dimmed prospects for a substantial recovery for the upstream sector of the industry in 1988.

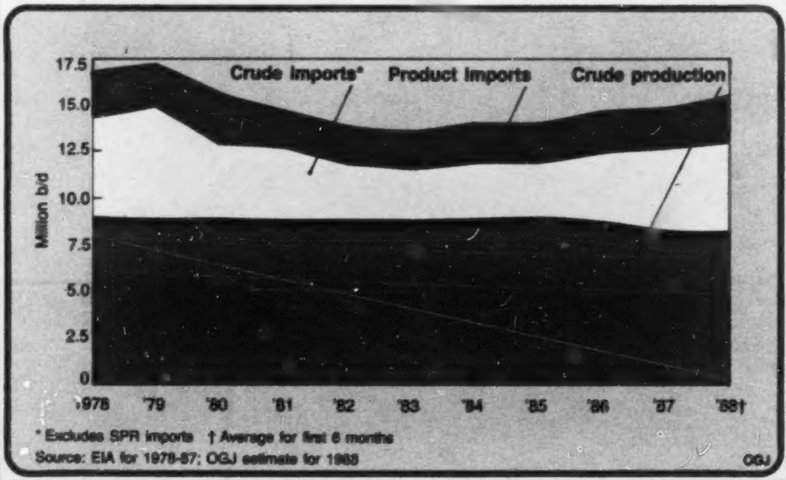
Drilling and development plans made as the year began have been curtailed, especially in the U.S., where the failure of natural gas prices to strengthen as expected has also hurt drilling activity.

Oil demand, refinery runs move up



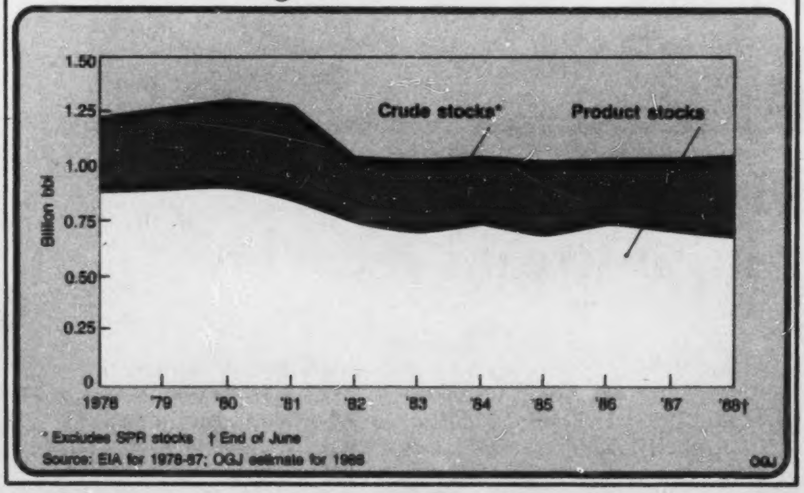
* Average for first 6 months.
Source: EIA for 1978-87, OGJ estimate for 1988

Crude production slips further, imports up



* Excludes SPR imports † Average for first 6 months
Source: EIA for 1978-87; OGJ estimate for 1988

Crude stocks higher



* Excludes SPR stocks † End of June
Source: EIA for 1978-87; OGJ estimate for 1988

But the news is not all bad.

Lower crude prices coupled with stronger product demand have brought healthy margins for U.S. refiners. And though the lower wellhead revenue from crude has hurt upstream profits, oil prices have not collapsed.

With half the year as history, 1988 results won't be as good as upstream planners thought 6 months ago. But it's likely the recovery—the slow, steady recovery—will not fail; it will just be delayed.

And better-than-expected product demand may make this year a pleasant surprise for refiners.

OPEC's tenuous control over excess crude producing capacity continues to keep oil markets uncertain. Much of the upstream industry's optimism as the year began was based on a firming of this control. But there has been little improvement in market stability.

As demand grows and producing countries get more involved in refining and distribution in key markets, this stability may come.

Until it does, any recovery in exploration and development will be slow.

And until operators begin drilling in earnest again, U.S. production is likely to continue to slip.

With 6 months of hindsight, here are highlights of Oil & Gas Journal's midyear assessment of 1988:

- Demand for petroleum products in the U.S. will be up more than anticipated, increasing 2%.
- U.S. crude and condensate production will average 1.7% below a year ago. Increased Alaskan production will help offset the decline elsewhere.
- Total imports will jump 8%, increasing U.S. dependence on imported crude and products.
- Refinery runs will grow with demand, increasing 2.1%; utilization rate will remain at 83%.
- Well completions in the U.S. will exceed last year by 9%, but won't reach the level expected as the year began; rotary rig activity outside the U.S. and Canada should meet the 7% growth expected earlier.
- The increase in oil output by both OPEC and non-OPEC producers is expected to be greater than demand growth for the year.

Good demand news. Oil & Gas Journal forecasts 1988 U.S. demand for petroleum products will average 16.995 million b/d, up 2% from 16.667 million b/d for 1987. First half demand was about 16.985 million b/d, up 2.8% from the same period a year ago; second half demand will average 17.005 million b/d.

Total demand, including exports of crude and products, will grow to 17.825 million b/d in 1988, up 2.3%

U.S. demand up again in 1988, crude supply down

	First half 1988		Third quarter 1988		Fourth quarter 1988		Year 1988	
	Volume, 1,000 b/d	% change from 1987	Volume, 1,000 b/d	% change from 1987	Volume, 1,000 b/d	% change from 1987	Volume, 1,000 b/d	% change from 1987
Demand								
Motor gasoline	7,170	1.0	7,465	1.2	7,315	1.1	7,280	1.1
Dist. 1-4	5,960	0.9	6,200	1.2	6,085	1.0	6,051	1.0
Dist. 5	1,210	1.1	1,265	1.2	1,230	1.3	1,229	1.2
Naphtha jet fuel	210	6.1	225	1.8	215	7.5	215	4.9
Dist. 1-4	145	6.6	160	1.3	150	6.4	150	4.9
Dist. 5	65	4.8	65	3.2	65	10.2	65	4.8
Kerosine jet fuel	1,215	4.5	1,215	4.0	1,275	3.7	1,230	4.1
Dist. 1-4	870	2.7	860	4.1	950	3.7	888	3.4
Dist. 5	345	9.5	355	4.1	325	3.5	342	6.2
Distillate	3,170	4.3	2,710	0.3	3,150	0.5	3,050	2.4
Dist. 1-4	2,765	3.9	2,300	0.2	2,765	0.4	2,649	2.2
Dist. 5	405	6.9	410	1.0	385	1.9	401	3.9
Residual fuel oil	1,350	5.6	1,180	– 7.1	1,240	0.3	1,280	1.1
Dist. 1-4	1,095	5.1	950	– 8.1	965	0.4	1,026	0.7
Dist. 5	255	7.6	230	– 3.0	275	—	254	2.8
LPG and ethane	1,685	6.5	1,540	2.1	1,810	1.8	1,680	4.2
Dist. 1-4	1,600	6.3	1,460	1.8	1,710	1.7	1,592	4.0
Dist. 5	85	10.4	80	6.7	100	3.1	88	7.3
Miscellaneous products	2,185	1.1	2,515	2.0	2,155	2.8	2,260	1.8
Dist. 1-4	1,860	1.0	2,150	2.0	1,850	2.7	1,930	1.7
Dist. 5	325	1.6	365	2.0	305	3.4	330	2.2
TOTAL DOMESTIC DEMAND	**16,985**	**2.8**	**16,850**	**0.8**	**17,160**	**1.5**	**16,995**	**2.0**
Dist. 1-4	14,295	2.6	14,080	0.7	14,475	1.4	14,286	1.8
Dist. 5	2,690	3.9	2,770	1.5	2,685	2.0	2,709	2.8
EXPORTS	**855**	**11.3**	**790**	**10.8**	**820**	**0.9**	**830**	**8.5**
Dist. 1-4	375	13.0	365	9.6	395	1.3	378	8.9
Dist. 5	480	10.1	425	11.8	425	0.5	452	7.9
TOTAL DEMAND	**17,840**	**3.2**	**17,640**	**1.2**	**17,980**	**1.5**	**17,825**	**2.3**
Dist. 1-4	14,670	2.8	14,445	0.9	14,870	1.4	14,664	2.0
Dist. 5	3,170	4.8	3,195	2.7	3,110	1.8	3,161	3.5
Supply								
DOMESTIC PRODUCTION								
Crude & lease condensate	8,285	– 1.5	8,170	– 0.6	8,100	– 3.1	8,210	– 1.7
Dist. 1-4	5,105	– 4.8	4,990	– 4.5	4,920	– 5.9	5,030	– 5.0
Dist. 5	3,180	4.5	3,180	6.1	3,180	1.5	3,180	4.1
NGL and other hydrocarbons	1,655	0.1	1,655	0.9	1,675	– 0.9	1,660	—
Dist. 1-4	1,560	– 1.0	1,550	0.5	1,570	– 0.4	1,560	– 0.5
Dist. 5	95	23.4	105	6.1	105	– 7.1	100	8.7
IMPORTS								
Crude	4,865	17.4	5,350	2.2	5,040	3.7	5,030	9.4
Dist. 1-4	4,690	19.0	5,150	2.1	4,840	3.7	4,842	10.1
Dist. 5	175	–13.4	200	2.6	200	5.3	188	– 5.1
Products & unfinished oils	2,045	6.0	2,165	3.0	2,145	4.2	2,100	4.7
Dist. 1-4	1,990	7.4	2,065	3.0	2,050	4.3	2,024	5.5
Dist. 5	55	–28.6	100	3.1	95	2.2	76	–11.6
Total	6,910	13.8	7,515	2.4	7,185	3.9	7,130	8.0
Dist. 1-4	6,680	15.3	7,215	2.4	6,890	3.9	6,866	8.7
Dist. 5	230	–17.6	300	2.4	295	4.2	264	– 6.7
OTHER SUPPLY								
Processing gain, loss, etc.	925	11.7	830	6.4	760	6.9	860	9.3
Dist. 1-4	705	13.0	665	6.6	560	7.9	659	10.2
Dist. 5	220	7.8	165	6.5	200	4.2	201	6.3
TOTAL NEW SUPPLY	**17,775**	**4.8**	**18,170**	**1.0**	**17,720**	**0.2**	**17,860**	**2.7**
Dist. 1-4	14,050	5.2	14,420	– 0.1	13,940	– 0.1	14,115	2.4
Dist. 5	3,725	3.4	3,750	5.8	3,780	1.6	3,745	3.5
STOCK CHANGE	**(65)**	—	**530**	—	**(260)**	—	**35**	—
Dist. 1-4	(620)	—	(25)	—	(930)	—	(549)	—
Dist. 5	555	—	555	—	670	—	584	—
CRUDE RUNS TO STILLS	**13,125**	**4.5**	**13,290**	**– 0.5**	**12,870**	**—**	**13,120**	**2.1**
TOTAL INPUT TO STILLS	**13,300**	**4.8**	**13,440**	**– 0.4**	**13,040**	**– 0.8**	**13,270**	**2.1**
TOTAL REFINERY CAPACITY	**15,965**	**2.5**	**16,015**	**2.9**	**16,015**	**1.3**	**15,995**	**2.2**
REFINERY UTILIZATION (%)	**83.4**	**1.7**	**83.9**	**– 2.4**	**81.4**	**– 1.8**	**83.0**	**0**
TOTAL INDUSTRY STOCKS*	**1,055**	**3.3**	**1,105**	**3.1**	**1,080**	**1.2**	**1,080**	**1.2**
Refined products*	700	1.0	735	—	725	1.0	725	1.0
Crude*	355	8.2	370	9.8	355	1.7	355	1.7
Govt. SPR crude stocks*	550	4.4	555	3.9	560	3.5	560	3.5

* Million bbl at end of period.

Crude, condensate slip further in first half

	First half 1988* (1,000 b/d)	First half 1987 (1,000 b/d)	Change, %
PAD District 1	41	42	– 2.4
Florida	22	22	—
Others	19	20	– 5.0
PAD District 2	838	876	– 4.3
Illinois	64	66	– 3.0
Kansas	161	165	– 2.4
Michigan	64	72	– 11.1
North Dakota	110	116	– 5.2
Oklahoma	358	373	– 4.0
Others	81	84	– 3.6
PAD District 3	3,684	3,882	– 5.1
Alabama	57	57	—
Arkansas	39	40	– 2.5
Louisiana	1,240	1,346	– 7.9
Mississippi	77	78	– 1.3
New Mexico	201	197	2.0
Texas	2,070	2,164	– 4.3
PAD District 4	544	563	– 3.4
Colorado	76	78	– 2.6
Montana	67	69	– 2.9
Utah	96	99	– 3.0
Wyoming	305	317	– 3.8
PAD District 5	3,180	3,045	4.4
Alaska	2,075	1,958	6.0
California	1,096	1,078	1.7
Others	9	9	—
Total	8,287	8,408	– 1.4

*Estimated.

Energy consumption and efficiency

Year	GNP, Billion 1982 $	Energy consumption, Trillion BTU	Energy consumption per GNP $, 1,000 BTU	Oil consumption, Trillion BTU	Oil consumption per GNP $, 1,000 BTU
1929	711.8	23,756	33.4	5,521	7.8
1933	501.6	16,900	33.7	4,833	9.6
1940	775.0	23,589	30.4	7,407	9.6
1946	1,077.8	30,494	28.3	10,002	9.3
1950	1,206.6	33,992	28.2	13,489	11.2
1955	1,494.9	39,703	26.6	17,524	11.7
1960	1,665.3	44,569	26.8	20,067	12.1
1965	2,087.6	53,343	25.6	23,242	11.1
1970	2,416.2	67,143	27.8	29,537	12.2
1971	2,484.8	68,348	27.5	30,570	12.3
1972	2,608.5	71,643	27.5	32,966	12.6
1973	2,744.1	74,282	27.1	34,840	12.7
1974	2,729.3	72,543	26.6	33,455	12.3
1975	2,695.0	70,546	26.2	32,731	12.1
1976	2,826.7	74,362	26.3	35,175	12.4
1977	2,958.6	76,289	25.8	37,122	12.5
1978	3,115.2	78,088	25.1	37,965	12.2
1979	3,192.4	78,898	24.7	37,123	11.6
1980	3,187.1	75,952	23.8	34,202	10.7
1981	3,248.8	73,989	22.8	31,931	9.8
1982	3,166.0	70,840	22.4	30,232	9.5
1983	3,279.1	70,497	21.5	30,054	9.2
1984	3,501.4	74,060	21.2	31,051	8.9
1985	3,607.5	73,944	20.5	30,922	8.6
1986	3,713.3	74,260	20.0	32,196	8.7
1987	3,821.1	76,042	19.9	32,627	8.5
1988*	3,932.3	77,500	19.7	33,290	8.5
Percentage change					
1929-40	8.9	– 0.7	– 9.0	34.2	23.1
1940-50	55.7	44.1	– 7.2	82.1	16.7
1950-70	100.2	97.5	– 1.4	119.0	8.9
1970-87	58.1	13.3	–28.4	10.5	–30.3

* Estimate.

from the year before. Exports started the year well above 1987 and are expected to average 830,000 b/d, up 8.5% for the year.

This reassessment of demand is a significant increase over the 0.7% increase to 16.66 million b/d projected earlier (OGJ, Jan. 25, p. 41).

Lower prices and stronger economic growth are reasons for the higher estimate.

Resid demand, for example, will be 80,000 b/d higher than anticipated earlier. Lower crude prices make heavy fuel oil much more competitive in the electric utility and industrial markets. The pickup in economic activity will also boost distillate demand an additional 65,000 b/d, and motor gasoline demand should be 60,000 b/d higher than projected earlier.

U.S. crude and condensate production will continue its decline in 1988, but the rate in the Lower 48 will be partially offset by increased Alaskan output.

Imports continue to increase rapidly, 13.8% in the first half and an expected 8% for the year.

U.S. dependence on imports has grown from 31.5% of demand in 1985 to a projected 42% this year. In the years just prior to 1985, U.S. dependence was partially masked by a drawdown of inventories.

But stock levels are now close to the minimum needed to avoid supply disruptions, so future demand increases will have to be met by increased imports. Stocks will increase during the second half to meet higher winter product demand.

Refinery runs will be up 2.1% to keep pace with demand. But capacity utilization is expected to remain at 83% because total refining capacity will expand by about the same amount.

Some new capacity has been added but much of the increase results from idle capacity being brought back onstream.

Price direction. Even with some rebound during the second half caused by increased demand, average crude prices this year will be lower than 1987.

OPEC's production quota helped firm prices during the first half of 1987 and higher demand helped out during the second half. Higher demand enabled OPEC countries to produce at a rate above the quota without a major impact on prices.

But failure of OPEC members to adhere to the quota during the first half of 1988 pushed oil prices lower.

To compound the problem, some of the excess crude has gone into stocks. This will tend to suppress the surge in demand for OPEC crude expected in

U.S. energy demand

	Trillion BTU			% change		% of total energy		
	1988	1987	1986	1988/87	1987/86	1988	1987	1986
Oil	33,290	32,627	32,196	2.0	1.3	43.0	42.9	43.4
Gas	17,390	17,180	16,708	1.2	2.8	22.4	22.6	22.5
Coal	18,200	18,020	17,262	1.0	4.4	23.5	23.7	23.2
Nuclear	5,370	4,920	4,475	9.1	9.9	6.9	6.5	6.0
Hydro & Other	3,250	3,295	3,619	- 1.4	- 9.0	4.2	4.3	4.9
Total	77,500	76,042	74,260	1.9	2.4	100.0	100.0	100.0

Source: 1986-87, EIA; 1988, OGJ estimate.

the third and fourth quarters.

The average price of internationally traded export crudes was $15.11/bbl for the first half of 1988, down from $17.40/bbl for the first half a year ago. The estimated average price at the end of June was $14.50/bbl, down $3.15/bbl from a year earlier.

The U.S. average wellhead price of crude for January and February was $13.53/bbl, down from $14.20/bbl the year before. Though more recent figures are not available, the U.S. wellhead price tracks the world export price.

Product prices have not slipped as far as crude prices. The OGJ survey of self-service unleaded motor gasoline pump prices shows the average for the first half of 1988 at 93.48¢/gal compared to 93.49¢/gal in 1987.

However, the average price for the week of June 22, 1988, was 94.83¢/gal, down from 96.10¢/gal a year earlier. Strong motor gasoline demand supported prices during the first half.

OGJ expects the average pump price for all motor gasoline to be 97¢/gal this year, compared to 95.7¢/gal in 1987. This is far below the peak of $1.353/gal in 1981.

Gasoline taxes averaged 23.81¢/gal this year, up from 22.96¢/gal the first half of 1987.

Residential heating oil prices averaged 84.1¢/gal for the first quarter vs. 78.9¢/gal last year.

If low crude prices persist, product prices will fall as refiners and marketers vie for market share.

Stiff competition in the fuel market has also kept natural gas prices down. After peaking in 1984 at $2.66/Mcf, gas prices dropped to $1.71/Mcf in 1987. Prices began this year ahead of 1987, but fell sharply in the spring. Spot prices in some areas were as low as $1.30-1.40/Mcf in June.

It is now expected that average natural gas prices for the year will be down slightly from 1987.

Energy demand. Despite fears of a slowdown, the U.S. economy keeps expanding. In this, the sixth consecutive year without an economic recession, real gross national product (GNP) is projected to increase 2.9%. This is the same rate of growth posted in 1986 and 1987.

Continued growth in energy-intensive industries will be a key cause of increased energy consumption as it was in 1987. Overall energy demand is expected to increase 1.9% this year to 77.5 quadrillion BTU (quads). Consumption gained 2.4% last year.

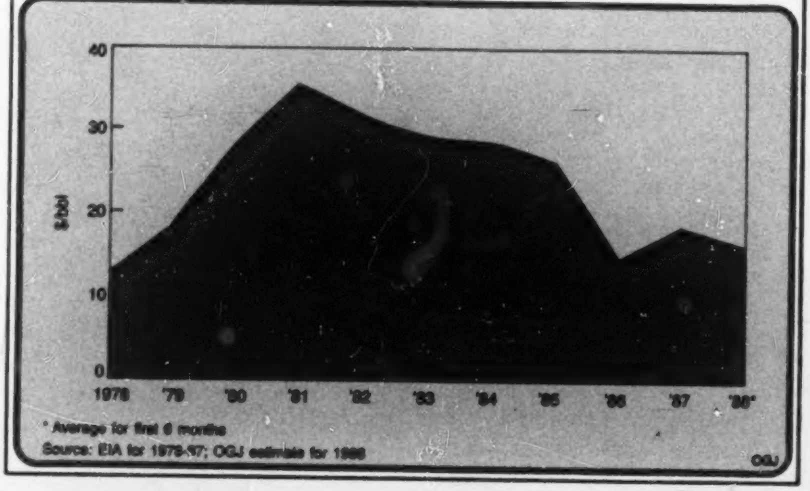
Energy consumption per unit of GNP fell continuously from 1970-1987, dropping 28.4%. Improvement in this ratio is expected again in 1988.

The improvement in energy efficiency has slowed the past 2 years. The revival of industries such as manufacturing and chemicals has increased energy consumption per unit of GNP.

GNP growth during 1986-88 will be 5.9% and energy growth 4.4%, a ratio of 0.75:1.

Oil energy demand in the U.S. is now expected to increase 2% in 1988 to 33.29 quads, raising oil's share of

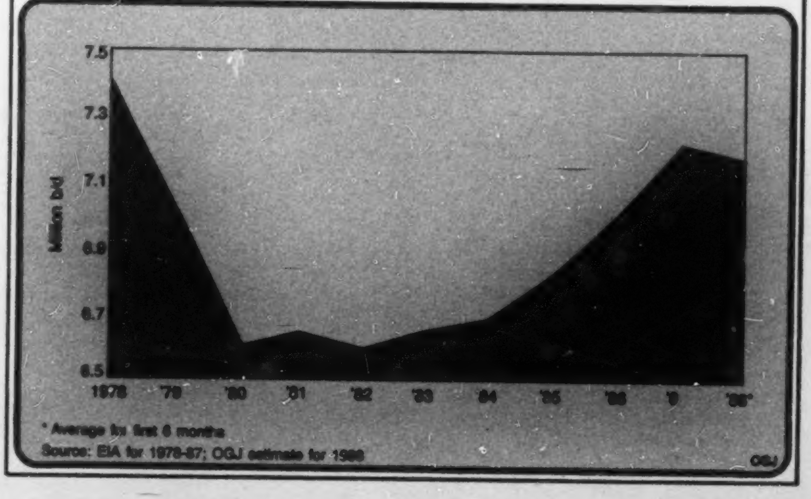
Refiner's crude costs slip



* Average for first 6 months

Source: EIA for 1978-87; OGJ estimate for 1988

Gasoline demand declines slightly



* Average for first 6 months

Source: EIA for 1978-87; OGJ estimate for 1988

U.S. crude and product prices

Year	Average wellhead price crude, $/bbl	Refiner's acquisition cost of crude, $/bbl	Retail motor gasoline, all types, ¢/gal	Residential heating oil, ¢/gal	Average wellhead price natural gas, $/Mcf
1976	8.19	10.89	59.5	40.6	0.58
1977	8.57	11.96	63.1	46.0	0.79
1978	9.00	12.46	65.2	49.0	0.91
1979	12.64	17.72	88.2	70.4	1.18
1980	21.59	28.07	122.1	97.4	1.59
1981	31.77	35.24	135.3	119.4	1.98
1982	28.52	31.87	128.1	116.0	2.46
1983	26.19	28.99	122.5	107.8	2.59
1984	25.88	28.63	119.8	109.1	2.66
1985	24.09	26.75	119.6	105.3	2.51
1986	12.51	14.55	93.1	83.6	1.94
1987	15.41	17.91	95.7	80.1	1.71
1988E	14.65	17.70	97.0	84.0	1.65

Source: 1976-1987 EIA; 1988 OGJ estimate.

U.S. natural gas supply and demand

	1985	1986	1987	% change 1987/86	1988	% change 1988/87
		Billion cu ft			Billion cu ft	
Production						
Texas	6,053	6,152	6,063	– 1.4	6,100	0.6
Louisiana	5,014	4,895	5,080	3.8	5,200	2.4
Other states	6,131	5,744	6,007	4.6	6,050	0.7
Total production	**17,198**	**16,791**	**17,150**	**2.1**	**17,350**	**1.2**
Imports						
Canada	925	748	988	32.1	1,090	10.3
Mexico	–	–	–	–	–	–
LNG*	24	2	0	–	10	–
Total imports	**949**	**750**	**988**	**31.7**	**1,100**	**11.3**
Supplemental gas	126	113	158	39.8	160	1.3
Losses, etc.†	–1,169	–1,225	–1,575	28.6	–1,670	6.0
Total supply	**17,104**	**16,429**	**16,721**	**1.8**	**16,940**	**1.3**
Exports	57	61	60	– 1.6	60	–
Stock change	– 234	147	– 19	–	–	–
Total consumption	**17,281**	**16,221**	**16,680**	**2.8**	**16,880**	**1.2**

* LNG Imports from Algeria in 1988, from Indonesia in 1986

† Extraction losses, and unaccounted for gas

Source: 1985, 1986, and 1987, EIA; 1988 OGJ estimates

U.S. refinery utilization

	Crude runs	Input to distillation units	Operable capacity	Utilization rate, %
	1,000 b/d	1,000 b/d	1,000 b/d	
1979	14,646	14,950	17,660	84.7
1980	13,453	13,788	18,209	75.7
1981	12,471	12,751	18,603	68.5
1982	11,766	12,176	17,445	69.8
1983	11,345	11,645	16,831	69.2
1984	12,044	12,335	16,034	76.9
1985	12,002	12,161	15,671	77.6
1986	12,716	12,817	15,467	82.9
1987	12,851	12,999	15,643	83.1
1988*	13,120	13,270	15,985	83.0
1979-88 change				
(Volume)	–1,526	–1,680	–1,675	–
(Percent)	– 10.4	– 11.2	– 9.5	–
1987-88 change				
(Volume)	+ 269	+ 271	+ 342	–
(Percent)	+ 2.1	+ 2.1	+ 2.2	–

*OGJ estimate.
Source: EIA

total demand to 43% from 42.9% in 1987.

Demand for energy from natural gas will gain 1.2% in 1988 to 17.39 quads, but its market share will slip to 22.4% from 22.6% in 1987.

Coal will also lose some market share, falling to 23.5% from 23.7% in 1987. Demand will be up only 1% at 18.2 quads. Hydroelectric and geothermal power is expected to supply 1.4% less energy in 1988, down to 3.25 quads.

Nuclear energy growth is expected to meet a substantial portion of the growth in demand for electricity. New facilities and increased utilization of the existing capacity are expected to boost output by 9.1% in 1988 to 5.37 quads. This will represent 6.9% of total energy, up from 6.5% last year.

Product demand details. With prices lower than anticipated, U.S. petroleum products demand moved up faster than expected during the first half, totaling an estimated 16.985 million b/d, up 2.8% or 462,000 b/d from the first half of 1987.

All major products posted increases, and all are expected to show increases for the full year—even residual fuel oil.

In the first half, motor gasoline demand led the way, up 169,000 b/d.

Distillate demand was up 131,000 b/d, LPG and ethane up 103,000 b/d, residual fuel up 71,000 b/d, and kerosine jet fuel up 52,000 b/d.

Demand growth will slow in the second half but still remain above 1987 levels. Demand for the year is projected at 16.995 million b/d, up 2% from 1987.

This year will continue the recovery of demand for petroleum products. U.S. consumption peaked in 1978 at 18.847 million b/d, but the sharp rise in prices brought it down to 15.231 million b/d in 1983.

After falling from 1977 to 1985, U.S. demand for resid recovered to 1.418 million b/d in 1986. But demand slipped last year as prices recovered.

Starting this year, the trend reversed again. Resid prices were down from a year ago, demand for electricity was up, industrial production was up, and resid demand rebounded.

For the first half, resid demand was up 5.6% at 1.35 million b/d. OGJ is projecting resid demand of 1.28 million b/d for the year, up 1.1% from 1987. If resid prices remain low relative to competing fuels, demand could grow even faster.

Economic growth, increased employment, and low prices have helped boost motor gasoline consumption, even though fleet efficiency continues to improve. Increases in the size of the fleet and the number of miles driven have more than offset the improved mileage of newer vehicles.

Motor gasoline demand averaged 7.17 million b/d for the first half of 1988, up 1% from 1987. For the year, OGJ expects demand to reach 7.28 million b/d, up 1.1% from last year.

This would be the second highest year on record, topped only by the 7.412 million b/d in 1978.

Relatively low and stable motor gasoline pump prices have been a key to higher gasoline consumption.

U.S. demand for jet fuel will gain 4.3% this year to 1.445 million b/d. Demand for naphtha jet fuel for the military is expected to gain 10,000 b/d to 215,000 b/d. Kerosine jet fuel for commercial aviation will increase 49,000 b/d to 1.23 million b/d.

Increased economic activity and competition in the U.S. airline industry should boost fuel demand.

Distillate demand should gain 2.4% to 3.05 million b/d this year, the highest level since 1979. Demand during the first half was 3.17 million b/d, up 4.3% from the same period a year ago. Most of the increase is expected in highway diesel demand, projected at 1.3 million b/d, up 64,000 b/d.

A small increase is expected in residential and commercial consumption. The relatively low No. 2 heating oil price is expected to slow conservation and slow conversions to natural gas.

Demand for LPG and ethane was up 6.5% in the first half of 1988 at 1.685 million b/d. The petrochemical industry's need for feedstocks has been the major reason for this spurt in consumption.

For the year, OGJ expects demand of 1.68 million b/d, 4.2% ahead of 1987.

Demand for all other products will increase more modestly, 1.8%, to 2.26 million b/d for 1988.

Natural gas. U.S. demand for natural gas is expected to increase only 1.2% in 1988 to 16.88 tcf; last year demand gained 2.8%.

Regulatory and contractual problems still have a grip on the U.S. gas industry. And if lower oil prices remain throughout the year, natural gas will meet stiff competition from heavy oil in the industrial and electric power sectors.

Marketed production of natural gas in the U.S. is expected to grow by 1.2% to 17.35 tcf in 1988. Imports will also increase by 11.3% to 1.1 tcf.

Most gas imports will come from Canada—1.09 tcf—with several shipments of LNG from Algeria totaling only about 10 bcf also expected.

Bad supply news. Again this year, U.S. crude and condensate produc-

Worldwide production jumps in first quarter

Country	First quarter 1988	First quarter 1987	Change	Change %
	— 1,000 b/d —			
Non-OPEC				
U.S.	8,307	8,384	−77	−0.9
Canada	1,598	1,463	135	9.2
Brazil	590	565	25	4.4
Mexico	2,552	2,524	28	1.1
Other (Non-OPEC)	1,126	1,160	−34	−2.9
Western Hemisphere	14,173	14,096	77	0.5
Norway	1,129	1,000	129	12.9
United Kingdom	2,546	2,563	−17	−0.7
Other	534	489	45	9.2
Western Europe	4,209	4,052	157	3.9
Egypt	861	878	−17	−1.9
Other (Non-OPEC)	906	759	147	19.4
Africa	1,767	1,637	130	7.9
Oman	580	530	50	9.4
Other (Non-OPEC)	296	273	23	8.4
Middle East	876	803	73	9.1
Australia	543	566	−23	−4.1
India	617	615	2	0.3
Malaysia	540	480	60	12.5
Other (Non-OPEC)	298	282	16	5.7
Asia-Pacific	1,998	1,943	55	2.8
Total Non-OPEC	23,023	22,531	492	2.2
OPEC	17,736	15,772	1,964	12.5
Total Non-Communist	40,759	38,303	2,456	6.4
Communist				
China	2,707	2,690	17	0.6
USSR	12,514	12,410	104	0.8
Other	441	441	—	—
Total Communist	15,662	15,541	121	0.8
Total World	**56,421**	**53,844**	**2,577**	**4.8**

*Crude and products stocks

	†1988, 1,000 bbl	Change '88/'87, %	†1987, 1,000 bbl	Change '87/'86, %	†1986, 1,000 bbl
Motor gasoline	222,000	– 3.7	230,421	– 1.3	233,377
Naphtha jet fuel	6,900	– 5.0	7,262	10.3	6,581
Kerosine jet fuel	39,300	1.6	38,677	– 2.3	39,603
Distillate fuel oil	107,000	2.5	104,391	– 4.1	108,825
Residual fuel oil	42,600	3.0	41,356	– 3.8	42,983
Unfinished oils	112,100	9.5	102,392	– 7.8	111,087
Other	170,100	0.8	168,676	– 1.6	171,413
Total products stocks	**700,000**	**1.0**	**693,175**	**– 2.9**	**713,888**
Crude stocks§	355,000	8.4	327,598	0.7	325,453
Total	**1,055,000**	**3.4**	**1,020,773**	**– 1.8**	**1,038,322**

*Excludes Strategic Petroleum Reserve. †At end of June. §Includes natural gas liquids and kerosine.
Source: 1986-87, EIA; 1988, OGJ estimate.

World crude prices

Country	Type of crude and API gravity	Current price,* $/bbl	Change 6-'88 1-'88 %	In effect Jan. 1, 1988, $/bbl	Change '88/'87, %	In effect Jan. 1, 1987, $/bbl	In effect Jan. 1, 1986, $/bbl	In effect Jan. 1, 1985, $/bbl	In effect Jan. 1, 1984, $/bbl
OPEC									
Saudi Arabia	Arabian Light 34°	14.85	−15.2	17.52	8.5	16.15	28.00	29.00	29.00
Abu Dhabi	Murban 39°	15.25	−14.9	17.92	15.2	15.55	28.15	29.31	29.56
Algeria	Saharan 44°	16.65	−11.8	18.87	9.1	17.30	29.50	30.50	30.50
Nigeria	Bonny Light 37°	16.55	−12.5	18.92	10.4	17.13	28.65	28.00	30.00
Libya	Es Sider 37°	15.80	−14.7	18.52	9.3	16.95	30.15	30.15	30.15
Indonesia	Minas 34°	16.90	− 3.8	17.56	7.9	16.28	28.53	29.53	29.53
Venezuela	Tia Juana 31°	17.62	—	17.62	16.7	15.10	28.05	29.84	29.84
Total OPEC		**14.98**	**−10.7**	**16.77**	**4.2**	**16.10**	**27.81**	**28.43**	**28.50**
OTHER									
U.K.	Brent blend 38°	16.50	− 8.3	18.00	− 1.4	18.25	26.00	28.65	30.00
Norway	Ekofisk 42°	16.50	− 6.3	17.60	4.4	16.86	26.61	28.50	30.25
Mexico	Isthmus 33°	15.93	7.4	14.83	−12.8	17.00	26.21	29.00	29.00
U.S.S.R.	Export blend 32°	15.95	0.9	15.80	−13.7	18.30	28.15	28.00	28.60
Total World		**15.17**	**− 8.4**	**16.57**	**2.0**	**16.24**	**27.10**	**28.33**	**28.61**
U.S.†		13.00	− 4.7	13.64	− 1.8	13.89	23.96	24.28	25.94

* Represents estimated contract prices based on government stated prices, netback deals and spot market quotations. Prices for 1983 – 1986 were official prices. † U.S. average crude oil wellhead price.

Source: Energy Information Administration

tion will continue the decline begun in early 1986.

Production during the first half of 1988 averaged an estimated 8.285 million b/d, down 1.5% from 8.408 million b/d in first half 1987. Output is expected to drop to 8.1 million b/d for the fourth quarter of this year, down 260,000 b/d from the same period of 1987.

For the year, production is forecast to average 8.21 million b/d, down 1.7%, or 139,000 b/d, from the 1987 average.

Production reached a recent peak of 8.971 million b/d in 1985, and averaged 9.108 million b/d during the first quarter of 1986.

But the price crash drastically reduced U.S. drilling and marginal wells were shut in.

Alaskan production continues to buoy U.S. output. During the first half of 1988 Alaskan production averaged about 2.075 million b/d, up 6% from first half 1987.

Average Alaskan production for the first half of 1988 was 250,000 b/d higher than the average for 1985. Over the same period, average Lower 48 output dropped 936,000 b/d.

During the second half of 1988, Lower 48 production will decline an additional 150,000 b/d, averaging 6.06 million b/d. Alaskan production is expected to be sustained at around 2.075 million b/d.

California and New Mexico were the only Lower 48 states that posted production increases during the first half. California output was up 18,000 b/d to 1.096 million b/d; New Mexico gained 4,000 b/d to 201,000 b/d.

Texas fell to second place behind Alaska as production slipped 94,000 b/d to 2.07 million b/d. Louisiana production was off 7.9% from a year ago, and Oklahoma output was down 15,000 b/d to 358,000 b/d.

Imports still climb. Increased demand and steadily declining crude production continue to increase the role of imports in meeting U.S. requirements. And current low stock levels mean industry cannot dip into inventories very deeply to meet second half demand.

Total imports, excluding crude for the Strategic Petroleum Reserve (SPR), were 6.91 million b/d during the first half of 1988. This is projected to grow to 7.35 million b/d during the last half, bringing the year's average to 7.13 million b/d, up 8% from 1987.

Crude imports, excluding the SPR, are expected to increase to 5.195 million b/d during the second half, up from 4.865 million b/d for the first half. Crude imports for the year will average 5.03 million b/d, up 9.4% from last year.

Imports by the government for the SPR have slowed due to budget constraints, but are expected to average 52,000 b/d in 1988.

Product imports are also expected to be up in 1988. During the first half product imports averaged 2.045 million b/d, up 6% from first half 1987. Another slight gain is expected to 2.155 million b/d during the second half. For the year product imports will average 2.1 million b/d, up 4.7% from 1987.

Resid imports were a key cause of the increase in product imports during the first half. Resid demand gained an estimated 71,000 b/d, and resid imports were up about the same. Total product imports were up 116,000 b/d.

Imports of other major products were also up during the first half.

For the first quarter of 1988 the leading source of crude imports was Saudi Arabia at 883,000 b/d. Imports from Saudi Arabia had fallen to only 131,000 b/d in 1985.

Total crude imports from OPEC averaged 2.403 million b/d for the first quarter, 51.1% of the total. This level was about the same as the 2.4 million b/d in 1987 but up substantially from the 1.312 million b/d in 1985.

First quarter product imports from OPEC were up 14.9% to 759,000 b/d, 35% of the total.

During the first quarter total imports from OPEC countries averaged 3.162 million b/d, 46% of the total. For all of 1987 OPEC imports were 45.8% of total imports at 3.06 million b/d.

Reduction of product inventories contributed an estimated 65,000 b/d to supply during the first half of 1988, and lowered stocks by 18 million bbl from year end 1987.

Crude stocks increased by 6 million bbl to 355 million bbl and are expected to remain at about this level

The reduction in product inventories did reduce first half import requirements slightly. But product stock levels are expected to move up during

U.S. imports

Sources of crude imports*

Country	Share of total 1988, %	First quarter average 1988, 1,000 b/d	Change 1988/1987, %	Annual average 1987, 1,000 b/d	Change 1987/1986, %	Annual average 1986, 1,000 b/d
Algeria	2.8	131	14.3	115	36.8	84
Indonesia	2.6	125	− 52.5	262	− 11.7	297
Nigeria	9.9	464	− 12.3	529	21.0	437
Saudi Arabia	18.8	883	37.6	642	3.8	618
Venezuela	9.1	430	− 11.9	488	17.3	416
Other OPEC	7.9	371	1.8	364	46.2	249
Total OPEC	**51.1**	**2,403**	**0.1**	**2,400**	**14.2**	**2,101**
Angola	3.4	159	− 11.4	180	76.4	102
Canada	14.0	659	8.3	608	6.7	570
Colombia	2.2	101	− 11.5	115	—	0
Mexico	14.5	682	13.4	602	− 3.0	620
Trinidad & Tobago	1.5	72	− 4.6	75	− 19.3	93
United Kingdom	6.5	304	− 0.2	304	− 4.0	317
Other Non-OPEC	6.8	320	− 18.0	390	4.1	375
Total imports	**100.0**	**4,700**	**0.6**	**4,674**	**11.8**	**4,178**

Sources of refined product imports

Country	Share of total 1988, %	First quarter average 1988, 1,000 b/d	Change 1988/1987, %	Annual average 1987, 1,000 b/d	Change 1987/1986, %	Annual average 1986, 1,000 b/d
Algeria	8.2	178	− 1.4	180	− 6.8	193
Saudi Arabia	5.9	128	16.4	110	63.6	67
Venezuela	16.6	360	13.8	316	− 16.1	377
Other OPEC	4.3	94	71.7	55	− 36.3	86
Total OPEC	**35.0**	**759**	**14.9**	[illegible]	**− 8.8**	**723**
Brazil	3.9	84	—	84	68.1	50
Canada	14.7	320	33.3	240	1.7	236
Mexico	2.6	56	4.8	53	− 31.8	78
Netherlands	3.1	67	10.1	60	12.0	54
Romania	2.4	52	− 4.0	54	1.9	53
Virgin Islands	11.1	241	− 11.5	272	12.1	243
Other Non-OPEC	27.3	593	2.3	579	− 4.7	608
Total imports	**100.0**	**2,171**	**8.3**	**2,004**	**− 2.8**	**2,046**

*Includes imports for the Strategic Petroleum Reserve.
Source: Energy Information Administration

the second half of 1988, boosting imports again.

Total stocks of 1.055 million bbl at mid 1988 represent only 62.1 days of supply, relatively low by historical standards. From 1960-68, year-end stocks ranged from 72.8 to 82.7 days' supply.

Total stocks will end the year at 1.08 billion bbl, up 1.2% from the end of 1987.

World production. OPEC is still wrestling with excess crude producing capacity and production quotas designed to firm up prices.

The present OPEC quota, effective July 1987, calls for maximum total production by OPEC members of 15.06 million b/d, plus Iraqi output. It was proposed that the Iraq production quota would be 1.54 million b/d, bringing total OPEC output to 16.6 million b/d. But Iraq has never agreed to the assigned quota. They have demanded a quota at least equal to that of Iran.

This dispute has left OPEC with a gaping hole in their quota dike, and other leaks have resulted from members disregarding quotas or circumventing the spirit of the system through reclassification of production.

OPEC production was 17.736 million b/d for the first quarter of 1988, up 12.5% from the year before and 1.136 million b/d above the official quota. The International Energy Agency (IEA) estimates that OPEC production moved up to 18.4 million b/d in April and 18.6 million b/d in May, putting output 2 million b/d above quota.

Iraq's production has been considerably above the quota that OPEC wanted adopted, at 2.646 million b/d during the first quarter.

Over the past 2 months several other OPEC countries have boosted output. Saudi Arabia increased production 200,000 b/d to their quota level; the UAE, which was already 150,000 b/d above quota increased production an additional 300,000 b/d.

Neutral Zone production, shared by Kuwait and Saudi Arabia, was increased 300,000 b/d.

Non-OPEC production also gained in the first quarter. At 23.33 million b/d, it was up 492,000 b/d from a year earlier. The largest increases were in Angola/Cabinda, 143,000 b/d; Canada, 135,000 b/d; and Norway, 129,000 b/d.

Increased production by OPEC and non-OPEC countries has exceeded the increase in demand, putting pressure on crude prices.

Based upon the IEA projections of non-Communist consumption during 1988, demand for OPEC oil should gain during the third and fourth quarters. However, demand for OPEC oil during the second quarter was only 17.2 million b/d, while estimated OPEC oil coming on the market was close to 18.5 million b/d.

This excess output must be going into storage and will probably have an impact on prices into the third quarter. ▪

OPEC production

Country	First quarter 1988	First quarter 1987	Change	Change, %	OPEC quota 1,000 b/d
	1,000 b/d				
Algeria	664	623	41	6.6	667
Ecuador	309	202	107	53.0	221
Gabon	175	151	24	15.9	159
Indonesia	1,134	1,110	24	2.2	1,190
Iran	1,955	2,044	− 89	− 4.4	2,369
Iraq	2,646	1,726	920	53.3	1,540
Kuwait	1,134	950	184	19.4	996
Libya	1,000	934	66	7.1	996
Neutral Zone*	226	406	−180	−44.3	—
Nigeria	1,300	1,178	122	10.4	1,301
Qatar	341	199	142	71.4	299
Saudi Arabia	4,197	3,559	638	17.9	4,343
United Arab Emirates	1,066	1,153	− 87	− 7.5	948
Venezuela	1,589	1,537	52	3.4	1,571
Total OPEC	**17,736**	**15,772**	**1,964**	**12.5**	**16,600**

*Shared by Kuwait and Saudi Arabia.

At midyear, majors trim drilling plans for 1988

John C. McCaslin
Exploration Editor

Oil prices haven't firmed as operators expected 6 months ago. And U.S. natural gas prices, poised for improvement at the first of the year, have slumped.

The result has been scaled-back plans for 1988 U.S. drilling by both majors and independents.

Outside the U.S., projections of drilling activity made at the beginning of the year stand a better chance of being met.

Major oil companies now plan to drill fewer wells in the U.S. than they planned in January, but more than they drilled last year. The 23% increase over 1987 that majors planned as the year began has been cut to an 11% expansion.

Total completions will also exceed last year, but the 16% increase over 1987 expected in January has now been trimmed to a 9% increase.

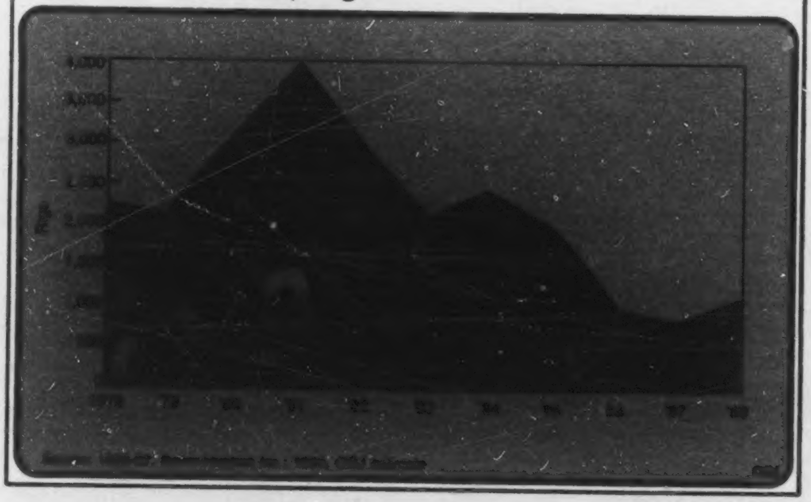
Wellhead revenue—the key to how much drilling operators can do—is expected to be down from last year. Higher gas production will not be enough to offset lower oil prices and production.

But because cost cutting has put many companies in better financial shape, and there is still confidence that profit is possible at expected prices, operators are expected to increase slightly in 1988 the share of revenue that they invest in drilling.

More encouraging is an increase since January in planned exploration drilling this year by major operators.

At mid course, 1988 is still likely to be the year U.S. drilling turns around. But the gains will be more modest than expected as the year began, when the average rotary rig count was expected to reach 1,080. At midyear, cumulative average for the year stood at 950, compared with 798 for the same period in 1987.

And in Canada, the average rig count through June was 209, up sharply from 139 at the same time last year.



U.S. active rotary rigs

Outside the U.S. and Canada, the active rig count stood at 1,025 in May, up 7% from the same time a year earlier.

Here's how the year looks with 6 months to go:

- The U.S. active rotary rig count will average 1,010, up 8% from an average of 936 last year.
- Operators will drill about 38,864 wells in the U.S. in 1988, an 8.7% increase over the estimated 35,744 wells drilled in 1987.
- Exploratory drilling will increase by about 18% from a modern low in 1987, to almost 5,400 wells this year.
- Footage drilled in the U.S. will top 176.4 million ft, raising average well depth to 4,550 ft.
- Major operators now plan to drill only 7,784 wells this year, including 941 wildcats. A total of 3,363 wells was drilled by the majors during the first half of the year.
- Drilling in western Canada will see 8,500 wells completed in 1988, up slightly from the January estimates.
- Outside the U.S. and Canada, cumulative rig count average through May was 1,027, on target with the 7% increase projected in January.

Europe, paced by the strong upsurge in the U.K., led the recovery in international drilling, followed by the Far East, with gains by India and Indonesia.

Increased activity in Mexico, Colombia, Venezuela, Libya, and Iraq has pulled Latin America, Africa, and the Middle East ahead of last year's levels, offsetting slumps in Brazil, Algeria, and Turkey.

Flat second half. There still is little chance oil prices will move much higher in the last half. But much leaner companies and much lower drilling costs mean there are still profit opportunities in the U.S. at today's crude prices.

And a boost in natural gas wellhead prices could be a key factor in a drilling revival.

Based on estimates by American Petroleum Institute, there were 19,185 wells drilled during the first 6 months of the year; 3,435 of these

The majors' outlook

	[illegible]	[illegible]	Total Drilled 1988	[illegible]	Planned 1988	[illegible]
Alabama	14	161	175	75	11	15
Alaska	55	108	163	104	5	4
Arizona	1	0	1	0	1	0
Arkansas	13	10	23	37	8	5
California	882	1,157	2,039	1,714	72	44
Colorado	39	150	189	93	18	23
Florida	2	7	9	2	5	3
Idaho	1	0	1	0	1	0
Illinois	65	61	126	113	0	0
Indiana	0	0	0	0	0	0
Iowa	0	0	0	[illegible]	0	[illegible]
Kansas	67	127	194	22	24	27
Louisiana	404	427	831	748	228	119
North	24	32	56	97	7	6
South	[illegible]	108	237	319	35	26
Offshore	[illegible]	290	538	332	186	87
Michigan	[illegible]	[illegible]	248	131	55	15
Mississippi	18	23	41	37	18	10
Missouri	1	0	1	1	1	0
Montana	30	54	84	77	29	14
Nebraska	6	18	24	22	17	7
Nevada	2	7	9	2	4	2
New Mexico	146	156	302	123	30	21
North Dakota	31	[illegible]	66	[illegible]	26	17
Oklahoma	158	190	348	[illegible]	46	52
[illegible]	[illegible]	12	12	8	12	[illegible]
Pennsylvania	[illegible]	71	105	[illegible]	5	0
South Dakota	0	2	2	0	2	0
Texas	[illegible]	[illegible]	2,502	[illegible]	258	61
[illegible]	[illegible]	[illegible]	423	[illegible]	90	[illegible]
[illegible]	[illegible]	[illegible]	66	[illegible]	34	[illegible]
[illegible]	[illegible]	[illegible]	154	[illegible]	17	[illegible]
[illegible]	[illegible]	[illegible]	1,678	[illegible]	96	[illegible]
[illegible]	[illegible]	[illegible]	121	[illegible]	11	[illegible]
[illegible]	[illegible]	[illegible]	60	[illegible]	10	[illegible]
[illegible]	[illegible]	[illegible]	38	[illegible]	8	[illegible]
[illegible]	[illegible]	[illegible]	2	[illegible]	2	[illegible]
[illegible]	[illegible]	[illegible]	2	[illegible]	2	[illegible]
[illegible]	[illegible]	[illegible]	18	[illegible]	0	[illegible]
[illegible]	[illegible]	[illegible]	229	[illegible]	53	[illegible]
[illegible]	[illegible]	[illegible]	7,784	[illegible]	941	[illegible]
[illegible]	[illegible]	[illegible]	1,332		410	
[illegible]	[illegible]	[illegible]	994		218	
[illegible]	[illegible]	[illegible]	286		161	
[illegible]	[illegible]	[illegible]	38		24	
[illegible]	[illegible]	[illegible]	8		1	
[illegible]	[illegible]	[illegible]	6		6	
[illegible]			3		3	

were wildcats.

But the traditional big second half is not likely in 1988. The Journal expects only a slight increase in the last half, resulting in total completions for the year of about 38,860. Exploration drilling's share of the total will slip in the second half, bringing total wildcats for the year to about 5,400.

Most areas of the U.S. will share in the cutback of drilling plans. But there are a few exceptions.

Coalbed gas development in Alabama and infill drilling and expansion of enhanced oil recovery projects in California, for instance, have increased drilling plans in those states.

U.S. highlights. The Journal estimates that operators will drill 250 wells in Alaska this year, down from the January plan. California totals should reach 3,250 this year, up from earlier estimates.

Colorado drilling will reach 1,000 wells this year, a far cry from the good years. Projections for other Rocky Mountain area states include 315 wells for Montana, 180 in Nebraska, 160 in North Dakota, 20 in South Dakota, 140 in Utah, and 900 in Wyoming.

The Powder River basin continues to be a fairly healthy place to look for oil in the region. There are several important new Minnelusa discoveries in northeastern Wyoming that have stirred development plans there. And exploration and field delineation continues in North Dakota and Montana's portion of the Williston basin.

And wildcatting continues in western Nebraska's Paleozoic play and in the Las Animas arch of eastern Colorado and far western Kansas.

There are plans for 250 wells in Alabama this year, 150 of these by one operator. New interest in coalbed gas development in Alabama plus continued Jurassic exploration in the southwestern corner of the state will add a big share of the new completions here. Deep marine work is also under way in Mobile Bay and adjacent waters.

Arkansas operators look for 400 completions this year; 800 are expected in North Louisiana, and 760 in East Texas. Most of the rigs working in East Texas District 5 are looking for more oil in the Alabama Ferry sector, a field that never seems to stop growing.

Illinois operators now plan to drill 1,500 wells this year, a significant drop from the more than 1900 planned as the year began. Most of this work will be in and around existing giant accumulations with only a smattering of out-of-the-way drilling. The same holds true for Indiana with 420 wells, and Kentucky with 1,070.

Michigan is still one of the bright

OGJ's revised drilling forecast for 1988—U.S. and Canada

State, district, province	Total comp.	First half estimates Wildcats	Field wells	Total ft (1,000)	Total comp.	1988 forecast Total wildcats	Field wells	Total ft (1,000)
Alabama	110	56	54	572	250	75	175	1,300
Alaska	55	2	53	552	163	5	158	1,635
Arizona	4	4	0	2	10	10	0	5
Arkansas	212	26	186	778	400	75	325	1,468
California	1,572	69	1,503	3,800	3,250	135	3,115	6,800
Colorado	581	148	433	3,602	1,000	200	800	6,231
Florida	2	1	1	17	15	10	5	216
Georgia	1	1	0	6	1	1	0	6
Idaho	1	1	0	10	3	3	0	30
Illinois	678	156	522	1,317	1,500	210	1,290	2,913
Indiana	165	75	90	248	420	100	320	630
Iowa	2	2	0	8	2	2	0	8
Kansas	1,630	549	1,081	5,060	3,500	660	2,840	9,864
Kentucky	482	102	380	894	1,070	150	920	1,661
Louisiana	1,121	191	930	8,605	2,362	470	1,892	18,645
North	400	45	355	1,640	800	120	680	3,280
South	378	42	336	3,591	860	130	730	8,365
Offshore	343	104	239	3,374	702	220	482	7,000
Michigan	315	151	164	1,400	600	240	360	2,700
Mississippi	151	57	94	1,253	380	115	265	3,150
Missouri	19	7	12	38	50	14	36	49
Montana	190	74	116	760	315	100	215	1,260
Nebraska	84	57	27	443	180	120	60	1,040
Nevada	6	6	0	36	18	8	10	108
New Mexico	400	62	338	2,480	1,147	100	1,047	6,124
New York	187	4	183	484	350	15	335	905
North Dakota	110	63	47	1,015	160	90	70	1,576
Ohio	1,011	8	1,003	3,842	1,900	15	1,885	7,144
Oklahoma	1,981	135	1,846	10,258	5,000	220	4,780	25,030
Oregon	0	0	0	0	12	12	0	—
Pennsylvania	855	19	836	3,057	968	30	938	4,801
South Dakota	13	6	7	35	20	8	12	54
Tennessee	123	10	113	191	211	50	161	327
Texas	5,888	1,168	4,720	31,458	11,545	1,824	9,721	59,726
District 1	603	69	534	1,389	1,385	165	1,220	3,191
District 2	267	96	171	1,579	510	200	310	3,262
District 3	460	129	331	3,666	820	180	640	5,110
District 4	417	131	286	3,127	810	180	630	6,075
District 5	148	26	122	968	360	50	310	2,251
District 6	251	54	197	1,580	400	100	300	2,520
District 7-B	783	170	613	2,372	1,400	200	1,200	4,240
District 7-C	411	79	332	2,540	610	120	490	3,085
District 8	957	79	878	6,267	1,950	130	1,820	12,770
District 8-A	557	94	463	3,368	1,200	119	1,081	7,256
District 9	728	148	580	2,231	1,500	210	1,290	5,300
District 10	206	22	184	1,330	400	45	355	2,584
Offshore	100	71	29	1,041	200	125	75	2,082
Utah	83	29	54	511	140	40	100	902
Virginia	13	4	9	59	20	6	14	90
Washington	1	1	0	9	2	2	0	18
West Virginia	458	3	455	1,827	1,000	18	982	4,225
Wyoming	681	188	493	4,418	900	265	635	5,839
Total U.S.	19,185	3,435	15,750	88,048	38,864	5,398	33,466	176,480
Western Canada	4,147	1,588	2,560	15,700	8,500	2,610	5,890	32,130
Alberta	3,000	1,222	1,778	11,940	6,200	2,100	4,100	24,676
Saskatchewan	980	302	679	2,932	1,900	400	1,500	5,654
British Columbia	108	48	60	610	190	60	130	1,140
Manitoba	41	13	28	120	160	40	120	470
North-Arctic	18	3	15	98	50	10	40	190
East Coast Offshore	0	0	0	0	3	3	0	36

Rotary rig activity by states

	6-months average			Week ending		
	[illegible]	[illegible]	% change	[illegible]	[illegible]	% change
Alabama	10.8	7.3	47.9	6	8	– 25.0
Alaska	12.2	7.3	67.1	13	9	44.4
Arizona	0.0	0.0	–	0	0	–
Arkansas	7.5	7.5	–	11	8	37.5
California	60.2	52.8	14.0	69	60	15.0
Colorado	29.0	19.0	52.6	21	23	– 8.7
Florida	1.8	1.7	5.9	2	4	– 50.0
Georgia	0.0	0.0	–	0	0	–
Hawaii	0.0	0.0	–	0	0	–
Idaho	1.5	0.0	–	1	0	–
Illinois	4.7	3.2	46.9	3	4	– 25.0
Indiana	0.0	1.2	–100.0	0	0	–
Iowa	0.0	0.5	–100.0	0	1	–100.0
Kansas	40.5	41.7	– 2.9	39	43	– 9.3
Kentucky	4.0	0.7	471.4	6	1	500.0
Louisiana	171.5	110.0	55.9	162	112	44.6
North	12.0	9.8	22.4	16	9	77.8
Inland waters	32.8	18.8	74.5	22	24	– 8.3
South	37.0	30.8	20.1	34	23	47.8
Offshore	90.0	51.0	76.5	90	56	60.7
Maryland	0.0	0.0	–	0	0	–
Michigan	22.8	22.7	0.4	19	20	– 5.0
Minnesota	0.0	0.0	–	0	0	–
Mississippi	18.2	10.8	68.5	21	6	250.0
Missouri	0.3	0.0	–	0	0	–
Montana	7.8	5.8	34.5	5	6	– 16.7
Nebraska	3.2	4.0	– 20.0	5	7	– 28.6
Nevada	1.2	1.5	– 20.0	1	1	–
New Mexico	36.5	27.5	32.7	37	32	15.6
New York	1.2	1.3	–	1	1	–
North Carolina	0.0	0.0	–	0	0	–
North Dakota	16.2	8.3	95.2	17	16	6.3
Ohio	14.8	19.7	– 24.9	7	12	– 41.7
Oklahoma	129.5	126.5	2.4	127	115	10.4
Oregon	0.0	0.0	–	1	0	–
Pennsylvania	14.2	13.7	3.6	16	19	– 15.8
Rhode Island	0.0	0.0	–	0	0	–
South Carolina	0.0	0.0	–	0	0	–
South Dakota	0.0	0.3	–100.0	0	2	–100.0
Tennessee	0.5	0.0	–	1	0	–
Texas	[illegible]	[illegible]	–	252	256	– 1.6
Offshore	18.3	17.2	6.4	16	17	– 5.9
Inland waters	4.8	0.5	860.0	3	1	200.0
Dist. 1 & 4	47.7	41.8	14.1	40	45	– 11.1
Dist. 2 & 3	36.7	37.2	– 1.3	31	34	– 8.8
Dist. 5 & 6	31.7	33.8	– 6.2	30	27	11.1
Dist. 7B & 9	28.3	25.3	11.9	29	23	26.1
Dist. 7C, 8 & 8A	107.0	92.3	15.9	89	94	– 5.3
Dist. 10	15.0	16.7	– 10.2	14	15	– 6.7
Utah	7.0	5.0	40.0	5	5	–
Virginia	2.0	1.7	17.6	1	2	– 50.0
Washington	0.8	0.0	–	1	0	–
West Virginia	7.3	12.3	– 40.7	7	12	– 41.7
Wyoming	36.5	25.3	44.3	37	28	32.1
Total U.S.	[illegible]	[illegible]	10.6	[illegible]	[illegible]	10.0
Canada	206.6	137.5	50.2	196	144	36.1
Canada, Offshore	2.5	1.3	92.3	4	3	33.3
Grand Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14.0

Note: Columns may not add to totals due to rounding.

spots in the U.S. drilling picture with 600 wells planned this year. Many of these wells are in the deep Prairie du Chien formation where gas reserves continue to climb. And interest remains healthy in the Silurian Niagaran reefs on the northern side of the Michigan basin.

Kansas operators plan 3,500 wells this year. An interesting aspect of this area's plans is the growing Pennsylvanian producing area hugging the Colorado state line.

There is a definite increase in drilling in the Anadarko basin of Oklahoma where huge gas reserves were found just a few years ago. Oklahoma operators still plan 5,000 wells this year, the same as planned at the beginning of 1988. A substantial hunk of this drilling will be in the western counties in the trough and on the shelves of the Anadarko basin.

There is also an upswing in gas development in the Arkoma basin, both in Oklahoma and western Arkansas. A recent Arbuckle discovery in this basin has opened a significant new exploratory frontier, and recent flush oil finds in southern Oklahoma are encouraging.

Plans for the year made 6 months ago are still holding up in U.S. Gulf Coast areas. South Louisiana operators will drill 860 wells this year, and there will be 702 wells completed in South Louisiana Offshore areas. Offshore Texas, the industry plans 200 wells in 1988.

Drilling plans for other Texas areas vary in numbers and significance (see table).

There will be little change in North Texas drilling plans this year with 1,400 planned for District 7-B and 1,500 for District 9. West Texas drilling plans have been cut back in many counties. There will be 610 wells drilled In District 7-C, 1,950 in 8, 1,200 in 8A. Panhandle operators plan only 400 wells this year, most of these geared for Granite Wash and Pennsylvanian gas zones.

Canadian plans. Alberta will lead the Canadian drilling parade this year with 6,200 wells, 2,100 of these exploratory holes. Operators plan 1,900 wells in Saskatchewan. In the southeastern corner of this province, success continues in a geologically difficult but lucrative Devonian reef deep oil play. An estimated 400 wildcats will be drilled in the province this year.

British Columbia expects 190 wells this year, Manitoba 160. Northern and Arctic developments will top out with 50 well completions in 1988. East Coast operators plan to complete only wildcats in Atlantic waters this year. ▪

WORLDWIDE GAS PROCESSING

AILLEEN CANTRELL
Director of Editorial Surveys

Capacities as of Jan. 1, 1988, and average production

		MMcfd		Production—1,000 gpd (Average based on the past 12 months)								
Country	No. plants	Gas capacity	Gas through-put	Ethane	Prop.	Isobut.	Process or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other	Total products
United States												
Alabama	6	177.0	161.5	16.0	178.5	44.8	100.4	....	1.2	71.1	....	412.0
Alaska	4	3,385.5	3,340.3	....	3.5	....	....	....	2,168.3	....	16.6	2,188.4
Arkansas	5	943.0	534.1	....	4.0	....	4.0	....	57.4	8.0	3.0	76.4
California	36	1,028.9	753.1	....	459.9	40.9	255.2	71.5	188.4	282.6	0.6	1,299.1
Colorado	37	925.2	498.4	....	191.5	....	42.0	17.7	452.1	41.3	25.5	770.1
Florida	2	790.0	647.0	105.4	138.0	14.0	77.0	....	....	75.0	....	409.4
Kansas	25	5,592.5	3,291.0	468.1	764.2	91.6	266.0	0.9	821.1	202.8	1.1	2,615.8
Kentucky	2	71.0	66.9	....	....	....	....	....	....	....	162.6	162.6
Louisiana	79	19,492.5	10,766.6	1,590.0	1,135.4	348.9	370.1	5.4	5,658.8	668.8	420.5	10,197.9
Michigan	28	4,744.1	1,439.5	....	71.5	....	....	15.7	730.5	103.8	17.6	939.1
Mississippi	6	901.0	396.7	....	9.2	....	8.0	....	26.1	11.5	....	54.8
Montana	6	22.0	8.2	....	23.8	2.2	....	22.1	25.0	2.1	0.8	76.0
Nebraska	2	3.5	2.2	....	....	....	....	....	7.2	....	....	7.2
New Mexico	27	3,310.8	2,107.1	213.6	[illegible]	16.9	65.2	....	3,687.8	76.0	21.3	4,281.5
North Dakota	9	308.0	213.8	....	[illegible]	....	88.1	....	83.6	102.6	13.1	483.4
Oklahoma	106	4,571.4	2,785.0	748.1	732.9	108.0	276.0	291.1	3,040.1	367.7	223.1	5,787.0
Pennsylvania	2	14.0	7.9	....	4.1	....	3.3	....	....	3.9	....	11.3
Texas	325	17,802.2	11,422.7	3,474.4	3,595.0	531.9	1,524.0	556.5	11,904.0	1,459.1	1,936.8	24,981.7
Utah	11	485.5	246.1	....	86.1	....	26.6	....	146.0	37.2	103.9	399.8
West Virginia	7	399.0	326.0	223.9	140.5	24.0	45.4	80.6	214.8	1.7	....	730.9
Wyoming	39	2,864.0	2,282.7	....	279.7	10.7	195.0	77.9	1,701.9	1,020.8	1,762.0	5,048.0
Total U.S.	**764**	**67,831.1**	**41,296.8**	**6,839.5**	**8,214.5**	**1,233.8**	**3,346.3**	**1,138.4**	**30,914.3**	**4,536.0**	**4,708.5**	***88,240.4**
Abu Dhabi	5	1,602.0	1,269.0	....	....	....	....	....	....	546.0	....	546.0
Algeria	4	5,335.2	4,268.2	....	....	....	....	632.8	....	....	5,449.2	6,082.0
Argentina	13	1,344.8	1,322.1	694.9	406.8	....	267.0	....	....	425.3	....	1,794.0
Australia	5	2,573.0	1,342.0	279.0	441.0	....	249.0	738.0	....	1,062.0	850.0	3,619.0
Austria	2	19.7	14.4	....	....	....	....	....	....	....	10.7	10.7
Bahrain	1	168.0	155.0	....	115.0	....	100.0	....	....	152.0	....	367.0
Bangladesh	2	240.0	178.0	....	....	....	....	....	....	....	8.2	8.2
Bolivia	2	474.0	177.3	....	1.4	2.5	....	161.7	....	61.5	136.9	364.0
Brazil	10	437.8	414.7	6.1	....	....	....	618.9	239.4	142.5	49.4	1,056.3
Brunei	2	1,032.0	845.0	....	7.7	....	....	....	54.4	242.0	....	304.1
Canada												
Alberta	415	21,905.8	12,328.2	4,894.3	1,762.0	115.4	928.4	905.1	4,877.1	2,504.7	196.3	16,183.3
British Columbia	13	2,294.4	1,250.3	....	147.3	....	92.0	....	....	75.3	52.5	367.1
Northwest Territories	2	196.0	22.1	....	....	....	....	....	....	....	....	....
Saskatchewan	19	260.4	166.9	39.2	....	....	....	....	81.4	0.3	12.4	133.3
Chile	2	470.0	400.0	....	194.0	....	124.0	....	....	102.8	....	420.8
China, Taiwan	4	271.0	105.7	41.2	29.8	1.9	16.9	....	1.6	14.9	....	106.3
Colombia	5	323.1	201.0	102.5	49.0	....	57.0	48.3	....	64.5	....	321.3
Denmark	1	450.0	240.0	....	....	....	....	....	....	....	100.0	100.0
Dominican Republic	1	....	....	....	....	....	....	....	....	....	277.2	277.2
Dubai	1	330.0	330.0	....	....	....	....	....	....	....	772.0	772.0
Ecuador	2	41.0	20.5	....	....	....	....	97.1	....	37.3	....	134.4
Egypt	9	1,449.0	1,338.7	....	....	....	....	796.5	....	....	1,176.8	1,973.3
France	1	570.0	563.0	....	139.0	....	132.0	....	....	270.0	....	541.0
Germany	5	399.0	341.0	....	....	....	....	....	....	....	....	....
Greece	1	10.5	9.4	....	....	....	....	....	86.6	....	....	86.6
Hungary	12	1,078.1	683.6	....	50.7	5.8	51.8	124.8	332.6	172.8	415.3	1,153.8
Indonesia	8	630.5	454.5	....	129.0	....	....	51.6	285.2	209.1	305.7	980.6
Italy	17	7,166.0	1,497.0	....	....	....	....	2.7	53.4	7.6	....	63.7
Kuwait	1	560.0	448.0	....	1,722.0	....	980.0	....	....	811.8	....	3,513.8
Libya	7	1,851.0	1,227.0	....	....	....	....	37.8	5,577.0	....	551.0	6,165.8
Malaysia	2	282.0	120.0	....	140.0	120.0	....	55.0	....	150.0	....	465.0
Mexico	10	4,334.0	3,249.0	3,487.7	5,657.2	3.5	153.0	385.4	....	316.5	14.0	10,017.3
Netherlands	1	440.0	96.0	....	....	....	....	....	....	....	4.9	4.9
New Zealand	3	852.0	94.0	....	39.0	....	....	....	....	9.0	....	48.0
Norway	2	950.0	455.0	....	785.0	102.0	262.0	....	251.0	197.0	....	1,597.0
Oman	8	626.0	309.0	....	....	....	....	....	202.0	43.0	....	245.0
Pakistan	6	1,095.0	923.0	....	....	....	....	37.0	....	....	12.1	49.1
Peru	2	70.0	37.0	....	3.4	....	1.0	5.6	28.9	....	4.0	42.9
Qatar	2	579.0	229.0	....	452.0	....	278.2	....	....	202.0	....	932.2
Saudi Arabia	5	4,300.0	....	....	....	....	....	....	1,176.0	....	....	1,176.0
Sharjah	2	990.0	960.4	....	220.5	....	251.2	....	....	....	1,341.4	1,813.1
Spain	3	428.0	93.0	....	....	....	....	....	....	....	94.0	94.0
United Kingdom	10	4,070.2	1,535.5	....	332.0	....	291.0	....	36.0	1,748.5	82.3	2,489.8
Venezuela	14	2,913.0	2,557.0	213.3	197.4	....	113.4	231.3	3,274.6	171.9	....	4,201.9
Total, outside U.S.	**643**	**75,411.5**	**42,270.5**	**9,758.2**	**13,021.2**	**351.1**	**4,347.9**	**4,928.6**	**18,557.2**	**9,740.3**	**11,916.3**	**70,821.8**

*Includes data reported only in aggregate form and, therefore, excluded from state-by-state figures above.

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gasc.	Other
ALABAMA											
Exxon Co. USA—Big Escambia Creek, Escambia Co., 4-1n-7e	40.0	30.0	6-7	16.0	51.3	....	45.3	....	....	20.5	....
FMP Operating Co.—Womack Hill, Choctaw Co., 9-10n-2w	4.0	2.5	3	....	6.7	....	7.5	....	....	3.7	....
Mobil Oil Exploration & Producing Southeast Inc.—Movico, Mobile Co.	10.0	NR	6	....	....	....	....	....	1.2	....	....
Phillips Petroleum Co.—Chatom, Washington Co., ne4-29-6n-4w	31.0	NR	3	....	....	....	....	....	....	....	....
Texaco Inc.—*Hatter's Pond, Mobile Co., 10-2s-1w	35.0	45.0	3	....	57.7	44.8	....	....	....	22.3	....
Unocal—*Chunchula, Mobile Co., 22-1s-2w	57.0	51.2	3	....	62.8	....	47.6	....	....	24.6	....
Total	**177.0**	**161.5**		**16.0**	**178.5**	**44.8**	**100.4**	....	**1.2**	**71.1**	....
ALASKA											
Arco Alaska Inc.—*Prudhoe Bay	3,300.0	3,300.0	3	....	....	....	....	....	2,140.0	....	....
*Swanson River LTS, Kenai Borough, 4-7n-9w	30.0	25.0	3	....	3.5	....	....	....	....	....	^{11}16.6
Marathon Oil Co.—Trading Bay, Kenai Borough, 5-18n-15w-51n	52.0	14.0	7	....	....	....	....	....	26.3	....	....
Unocal—Granite Point, Kenai Peninsula, 28-11n-12w	3.5	1.3	3	....	....	....	....	....	2.0	....	....
Total	**3,385.5**	**3,340.3**		....	**3.5**	....	....	....	**2,168.3**	....	**16.6**
ARKANSAS											
Amoco Production Co.—*Chalybeat Springs, Columbia Co., 34-19s-19w	28.0	25.0	7	....	....	....	....	....	24.6	....	....
Associated Natural Gas Inc.—Walker Creek, Columbia Co., 24-19s-23w	30.0	26.5	2	....	....	....	....	....	19.6	....	....
Endevco Inc.—Cummings	10.0	4.0	^{7}1	....	....	....	....	....	....	....	....

Legend

To arrive at more accurate totals, natural-gas throughput and liquids production are estimated at 80% capacity in those cases where only capacities are available. This explains apparent discrepancies in the addition of some columns.

The letters NR mean no response.

*Indicates cycling operations.

The symbol < denotes less than 100 gal/day.

The process/conditioning methods in the third column are identified by the following numbers:

1—absorption
2—refrigerated absorption
3—refrigeration
4—compression
5—adsorption
6—cryogenic-Joule-Thomson
7—cryogenic-expander
8—stabilization

Agents used in processes 1, 2, and 5 are indicated by superscripts as follows:

^{1}absorption oil
^{2}activated alumina
^{3}amine
^{4}anhydrous ammonia
^{5}Asorball
^{6}coal
^{7}DEA
^{8}desiccant
^{9}DGA
^{10}diesel-No. 1
^{11}ep naphtha
^{12}freon
^{13}glycol
^{14}hot potassium carbonate
^{15}iron sponge
^{16}Jet A
^{17}kerosine
^{18}kero-propane
^{19}lean oil
^{20}MDEA,
^{21}Mea,
^{22}mineral seal oil
^{23}mole sieve
^{24}naphtha
^{25}natural gasoline
^{26}propane
^{27}Purisol
^{28}Q-Sol
^{29}Selexol
^{30}Sepasolv
^{31}silica gel
^{32}Sorbead
^{33}Sulfinol
^{34}Sulphalene
^{35}TEG
^{36}Varsol
^{37}mw100
^{38}mw110
^{39}mw115
^{40}mw120
^{41}mw125
^{42}mw127
^{43}mw130
^{44}mw131
^{45}mw133
^{46}mw140
^{47}mw145
^{48}mw150
^{49}mw160
^{50}mw175

Products listed in the last column are identified by numbers:

1—isopentane
2—upgraded motor fuel
3—diesel
4—kerosine
5—ethane-propane mix
6—solvent naphtha
7—jet fuel
8—normal pentane
9—residuum, bottoms
10—distillate, fuel oil
11—condensate
12—gas oil.

Figures in parentheseis do not represent primary production, and are not added in state totals.

Since this compilation includes cycling plants reprocessing pipeline gas, totals shown here for gas throughput do not relate directly to government data on total gas processed, or sold. Similarly, liquids production figures are based on yearly average and do not necessarily reconcile with government data.

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Natural Gas Pipeline Co. of America—PP 370, White County, 29-7n-7w	850.0	456.0	3	....	....	....	....	....	13.2	....	....
Oxy NGL Inc.—*Walker Creek, Columbia Co., 23-19s-23w	25.0	22.6	2	....	4.0	....	4.0	....	....	8.0	[11]3.0
Total	**943.0**	**534.1**		....	**4.0**	....	**4.0**	....	**57.4**	**8.0**	**3.0**
CALIFORNIA											
Arco Oil & Gas Co.—No. Coles Levee No. 8, Kern Co., 32-305-25e MDB&M	20.0	12.9	[26]2	....	35.9	5.2	10.7	....	....	12.6	....
Ojai Timber No. 18, Ventura Co., Rancho Ojai 36	3.0	6.4	3	....	....	....	....	....	....	<0.1	....
Chevron USA Inc.—Carpinteria, Santa Barbara Co., 33-4n-25w	23.0	5.9	3	....	0.6	....	3.4	....	....	1.7	....
Huntington Beach, Orange Co., 3-6s-11w	3.5	2.2	3	....	....	....	....	....	2.5	....	....
Inglewood LTS, Los Angeles Co., 8-25-4w	15.0	6.9	3	....	....	....	....	....	15.1	....	....
Kettleman 3-P, Kings Co., 3-22s-17e	10.0	5.3	3	....	....	....	....	....	7.9	....	....
McKittrick Seventeen-Z, Kern Co., 17-30s-22e	80.0	52.7	[26-1]2	....	50.6	....	....	....	52.5	....	....
Murphy-Coyote, Orange Co., 18-3s-10w	5.0	1.3	3	....	....	....	....	....	2.1	....	....
Race Track 32-Z, Kern Co., 32-30s-29e	7.0	0.5	3	....	....	....	....	....	0.3	....	....
Taft 1-C LTS, Kern Co., 1-32s-23e	16.0	11.8	3	....	3.0	....	4.5	....	....	14.4	....
Torrance, Los Angeles Co., 24-4s-14w	3.0	0.9	3	....	....	....	....	....	1.3	....	....
Department of Energy—35R, Kern Co., 30s-23e-35-R	94.0	74.3	[1]1	....	49.4	....	52.8	....	....	45.2	....
LTS-1, Kern Co., 30s-23e-35R	100.0	115.7	3	....	78.5	....	75.5	....	....	66.9	....
LTS-2, Kern Co., 30s-23e-35R	100.0	120.3	3	....	85.9	....	68.3	....	....	66.3	....
Marathon Oil Co.,—*South Coles Levee, Kern Co., 3-31s-25e	80.0	49.0	1	....	17.9	2.7	5.1	....	....	13.5	....
Mobil Oil Corp.—Rincon, Ventura Co., 7-3n-24w SBB&M	20.0	8.0	3	....	....	....	....	....	....	....	....
Petrolane Lomita Gasoline Co.—Harbor, Los Angeles Co.	40.0	12.0	4	....	....	....	....	....	4.5	....	....
Signal Hill, Los Angeles Co.	14.0	5.0	3	....	2.5	....	....	....	20.0	....	....
Phillips Petroleum Co.—Huntington Beach, Orange Co., 3-6s-11w	15.0	NR	3	....	....	....	....	....	6.1	....	....
Shell Western E&P Inc.—Clark Ave., Santa Barabara Co., 9-9n-33w	3.6	1.7	3	....	....	....	....	....	2.0	....	....
Huntington Beach, Orange Co., 3-6s-11w	15.0	3.1	3	....	....	....	....	....	7.0	....	....
Kernridge, Kern Co., 32-28s-1e	50.0	61.6	2	....	19.6	21.9	....	51.8	....	....	....
Molino, Santa Barbara Co., 31-5n-31w	20.0	0.5	2	....	0.1	....	....	0.4	....	....	....
Sun Exploration & Production Co.—Newhall, Los Angeles Co., 27-4n-17w	NR	19.4	[19]2	....	4.0	....	....	....	6.5	....	....
Texaco Inc.—Buena Vista Hills, Kern Co., 8-32s-24e MDB&M	20.0	6.0	[19]1	....	6.3	....	....	....	8.8	....	....
Cymric, Kern Co., 26-29s-22e MDB&M	2.0	2.0	3	....	....	....	....	....	1.7	....	....
Lost Hills, Kern Co., 9-27s-21e	60.0	36.0	3	....	13.4	....	....	....	28.6	....	....
Montebello, Los Angeles Co.	2.0	0.4	3	....	....	....	....	....	0.2	....	....
Shiells Canyon, Ventura Co., 4-4n-19w-SBBM	18.0	7.4	[19]2	....	7.2	5.3	....	....	....	5.7	....
Ventura Co., 27-3n-23w SBB&M	20.0	14.0	[19]2	....	21.8	5.8	13.0	....	....	11.0	....
Unocal—Battles, Santa Barbara Co., 24-10n-34w SBB&M	35.0	13.0	[48]1	....	15.0	....	12.2	....	....	12.3	....
Bell, Los Angeles Co., 6-3s-11w, SBB&M	0.6	0.5	4	....	....	....	....	....	....	....	[11]0.6
*Coalinga Nose, Fresno Co., 7-20s-16e, SBB&M	70.0	65.9	7	....	40.6	....	9.7	....	....	26.5	....
Dominguez, Los Angeles Co., 33-3s-9w SBB&M	3.0	2.1	3	....	....	....	....	3.7	....	....	....
Santa Clara Valley, Ventura Co., 31-4n-18w, SBB&M	17.0	10.2	7	....	....	....	....	15.6	....	6.5	....
Stearns, Orange Co., 7-3s-9w SBB&M	20.0	6.2	[48]1	....	7.6	....	....	....	21.3	....	....
Total	**1,028.9**	**753.1**		....	**459.9**	**40.9**	**255.2**	**71.5**	**188.4**	**282.6**	**0.6**
COLORADO											
Amoco Production Co.—Wattenberg, Adams Co., 32-3s-65w	150.0	36.0	7	....	....	....	....	....	36.9	....	....
Associated Natural Gas Inc.—Eaton, Weld Co., se 34-7n-66w	15.0	10.9	3	....	....	....	....	....	31.2	....	....
Greeley, Weld Co., sw 25-5n-66w	25.0	21.4	3&6	....	....	....	....	....	58.7	....	....
Kersey, Weld Co., se 35-4n-66w	35.0	22.2	3	....	....	....	....	....	48.6	....	....
Lucerne, Weld Co., nw¼ se½ 28-6n-65w	15.0	12.6	3&6	....	....	....	....	....	38.1	....	....
Brighton Gas Processors—Brighton, Weld Co., se4 se4 28-1n-67w 6th PM	2.5	1.3	3	....	....	....	....	....	4.5	....	[11]0.3
Cabin Creek Gas—Cabin Creek, Adams Co., sw4 nw4 31-3s-59w 6th PM	1.5	0.2	3	....	....	....	....	....	1.7	....	[11]<0.1
Celsius Energy Co.—Dove Creek, Dolores Co., 5-40n-18w	10.0	6.4	3	....	....	....	....	....	17.9	....	....
Chevron USA Inc.—Rangely Hagood, Rio Blanco Co., 23-2n-102w	10.0	4.0	[20]2	....	....	....	....	....	14.7	....	....
*Rangely CO_2, Rio Blanco, 32-2n-102w	39.0	39.0	4	....	....	....	....	....	....	....	[11]25.2
Conoco Inc.—Dragon Trail, 6PM, 2-102w-3s	18.0	8.3	[1]2	....	7.5	....	....	....	....	8.0	....
Coors Energy Co.—Wattenberg, Weld Co., 25-1n-68w	8.0	6.2	3	....	....	....	....	....	4.8	....	....
Enron Gas Processing Co.—Greeley, Weld Co., sw 25-5n-6w	6.0	2.4	3	....	2.0	....	....	....	3.0	....	....
Four H Partnership—Piceance Creek, Rio Blanco Co., 15-25-96w (25 miles se of Rangely)	40.0	15.0	[19]2	....	6.0	....	....	....	6.0	....	....
Greeley Gas Co.—Clyde, Prowers Co., 19-23s-45w	5.0	4.0	3	....	....	....	....	....	....	2.5	....
Gulf Energy Gathering & Processing—Chalice, Arapahoe Co., 10-4s-64w	3.0	1.4	3	....	....	....	....	3.5	....	....	....

Company, plant, location	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Running Creek, Elbert Co., 21-6s-64w	3.5	3.2	3	....	....	....	....	12.2	....	....	....
Koch Hydrocarbon Co.—Third Creek, Adams Co., 18-25-65w	25.0	15.3	2	....	17.2	....	....	....	48.3	....	....
Loveland Gas Processing CL—*Loveland, Larimer Co., se-se-se30-5n-68w	6.0	2.0	3	....	3.3	....	....	....	....	†3.8	....
McMoRan Oil & Gas Co.—Yenter, Logan Co., nw¼ 2-8n-54w	8.0	4.0	$^{19}2$	....	7.8	....	....	....	7.2	....	....
Northwest Pipeline Corp.—Foundation Creek, Rio Blanco Co., 26-45n-102w	20.0	4.5	3	....	....	....	....	....	2.9	....	....
Ignacio, La Plata Co., sw¼ 36-34n-114w	300.0	176.0	7	....	84.0	....	42.0	....	....	27.0	....
North Douglas Creek, Rio Blanco Co., 19-1s-101w	20.0	7.6	3	....	....	....	....	....	6.7	....	....
Planet Engineers Inc.—*McClave, Kiowa Co., nw ne sw 32-20s-48w	7.5	1.9	2	....	2.6	....	....	2.0	....	....	....
Rocky Mountain Natural Gas Cl—											
Collbran, Mesa Co., 35-9s-95w	5.0	4.6	3	....	....	....	....	....	0.5	....	....
Piceance, Rio Blanco Co., 22-1n-97w	15.0	1.2	3	....	....	....	....	....	1.1	....	....
Slick Rock, San Miguel Co., 30-44n-18w	15.0	5.0	3	....	....	....	....	....	1.4	....	....
South Canyon, Garfield Co., 3-8s-104w	15.0	7.0	3	....	....	....	....	....	1.5	....	....
Roggen Gas Processing Co.—Roggen,											
Main, Weld Co., se¼ sw¼ 24-2n-63w	31.0	25.3	7	....	46.8	....	....	....	48.4	....	....
Vallery, Morgan Co., 15-3n-59w	1.5	0.8	3	....	....	....	....	....	2.7	....	....
Sun Exploration & Production Co.—Denver Central, Arapahoe Co., 5-5s-62w	12.0	4.0	$^{19}2$	....	12.2	....	....	....	10.0	....	....
Texaco Inc.—Wilson Creek, Rio Blanco Co., 27-3n-94w	4.5	1.8	3	....	2.1	....	....	....	3.4	....	....
Texas Oil & Gas Corp.—Baca County, 11-33s-42w Grid 9	5.0	1.0	3	....	....	....	....	....	0.5	....	....
Union Pacific Resources—Mt. Pearl, Cheyenne Co., 35-13s-48w	1.7	1.6	3	....	....	....	....	....	4.8	....	....
Vessels Gas Processing Ltd.—Ft. Lupton, Weld Co., se¼ 28-1n-67w	45.0	40.0	3	....	....	....	....	....	45.0	....	....
Vessels Oil & Gas Co.—Ft. Lupton Fractionator, Weld Co., se½ 28-1n-67w	...	...	§	(35.0)	(63.0)	....	(58.0)	....	....	(34.0)	....
Western Gas Processors Ltd.—											
Lanson Farms, Weld Co., nw4-ne4 25-2n-68w	1.5	0.3	3	....	....	....	....	....	1.6	....	....
Total	**925.2**	**498.4**		....	**191.5**	....	**42.0**	**17.7**	**452.1**	**41.3**	**25.5**

†Butane-gasoline mix. §Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

FLORIDA

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Enron Gas Processing Co.—Brooker, Bradford Co.	700.0	619.0	$^{19\text{-}26}2$	....	48.0	14.0	14.0	....	....	48.0	....
Exxon Co. USA—Jay, Santa Rosa Co., 9 n43-5n-29w	90.0	28.0	6-7	105.4	90.0	....	63.0	....	....	27.0	....
Total	**790.0**	**647.0**		**105.4**	**138.0**	**14.0**	**77.0**	....	....	**75.0**	....

KANSAS

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—Ulysses, Grant Co., 5-29s-38w	400.0	131.0	$^{19\text{-}49}2$	....	40.8	....	....	....	88.8	....	....
Anadarko Production Co.—Cimarron, Seward Co., 23-33s-32w	15.0	17.0	$^{46}2$	....	9.6	....	....	....	8.8	....	....
Woods, Seward, 22-33s-34w	8.0	10.0	$^{46}2$	....	4.1	....	....	....	7.2	....	....
Colorado Interstate Gas Co.—											
Lakin, Kearney Co., n2 ne4 29-24s-36w	250.0	50.5	1	....	....	....	....	....	....	6.9	....
Morton Co.	25.0	13.0	3	0.9	6.9	1.6	4.4	....	....	19.8	....
Enron Gas Processing Co.—Bushton ethane, Ellsworth Co., 31-17s-9w	500.0	500.0	7	465.0	....	....	....	....	....	....	....
Bushton hydrocarbon, Ellsworth Co., 31-17s-9w	950.0	896.0	$^{19\text{-}26}2$	....	633.0	90.0	180.0	....	....	144.0	....
Enron Helium Co.—Ellsworth Co., 31-17s-19w	500.0	325.0	6	....	....	....	....	....	....	....	‡1.1
KN Energy Inc.—Scott City Helium, Scott Co., 17-18s-33w	75.0	62.0	3	2.2	33.8	....	18.5	....	....	4.3	....
Scott City NGL, Scott Co., 17-18s-33w	150.0	99.8	1	....	....	....	2.0	....	....	12.8	....
Mesa Limited Partnership—Ulysses, Grant Co., 10-30s-37w	242.0	46.1	$^{19}2$	....	....	....	....	....	58.8	....	....
Mobil Oil Corp.—Hickok, Grant Co., 31-28s-35w	210.0	102.0	$^{1}1$	....	....	....	....	....	38.0	....	....
National Helium Corp.—Seward Co., 23-33s-32w	1,000.0	374.0	3	....	0.9	....	50.1	....	51.9	....	....
Northern Natural Gas Co.—Holcomb, Finney Co., 3-24s-34w	200.0	168.9	3	....	....	....	....	....	35.4	....	....
Oxy NGL Inc.—Cheney, Kingman Co., nw4 22-28s-5w	100.0	29.8	7	....	....	....	....	....	52.0	....	....
Hutchinson, Reno Co., sw4 22-23s-6w	....	....	†	(83.0)	(487.0)	(87.0)	(203.0)	....	....	(176.0)	....
Jayhawk, Grant Co., 2-29s-35w	550.0	284.6	2&6	....	....	....	....	....	272.0	....	....
Midway, Kingman Co., 33-27s-5w	30.0	22.9	2	....	....	....	....	....	31.5	....	....
Spivey, Harper Co., 5-31s-8w	66.0	21.0	1	....	22.0	....	11.0	....	....	15.0	....
Sunflower, Scott Co., 17-18s-33w	168.0	66.3	3&6	....	....	....	....	....	85.0	....	....
Wichita, Sedgwick Co., 17-28s-1e	89.0	53.3	7	....	....	....	....	....	71.0	....	....
Wilburton, Morton Co., 33-34s-41w	5.0	2.0	3	....	....	....	....	....	7.9	....	....
Peoples Natural Gas Co.—Burrton, Harvey Co., 21-23s-34w	4.5	3.0	3	....	....	....	....	0.9	....	....	....
Texaco Producing Inc.—Medicine Lodge, Barber Co. 13-32s-12w	30.0	6.0	$^{19}1$	....	4.8	....	....	....	4.6	....	....
Minneola, Ford Co., 13-29s-25w	25.0	6.8	$^{19}2$	....	8.3	....	....	....	8.2	....	....
Total	**5,592.5**	**3,291.0**		**468.1**	**764.2**	**91.6**	**266.0**	**0.9**	**821.1**	**202.8**	**1.1**

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). ‡Helium—MMcfd.

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
KENTUCKY											
Kentucky Hydrocarbon—Dwale Cryogenic, Floyd Co.	20.0	15.8	3&7	....	....	....	....	....	26.8	....	....
Maytown, Floyd Co.	51.0	51.1	3-6-7	....	....	....	....	....	135.8	....	....
Total	**71.0**	**66.9**		....	....	....	....	....	**162.6**	....	....
LOUISIANA											
Amoco Production Co.—TSMA, Vermilion Par., 11-14s-1e	297.0	81.0	[19-39]2	....	....	....	....	....	78.6	....	....
Arco Oil & Gas Co.—*Bayou Sale, St. Mary Par., 17-ILS-9e	97.0	36.6	[19]2	....	8.1	....	5.0	....	....	5.4	....
Arkla Inc.—Gayles, Caddo Par., 30-16n-12w	3.0	1.3	3	....	....	....	....	....	0.3	....	....
Associated Natural Gas Inc.—Minden, Webster Par.	55.0	33.4	2	....	....	....	....	....	41.6	....	....
Bruin Petroleum Inc.—*Port Hudson, East Baton Rouge, Par.	NR	40.0	3	....	....	....	....	....	24.0	....	....
Claiborne Gasoline Co.—Claiborne Par., 20-21n-4w	75.0	46.7	2	....	27.0	12.7	16.3	....	....	29.7	....
Coastal Oil & Gas Corp.—Pelican, St. Mary Par., 51&52 15s-11e	250.0	233.0	7	....	....	....	....	....	194.2	....	....
Conoco Inc.—*Acadia Par., 31-9s-1w	65.0	30.8	7	24.9	14.0	....	9.9	....	....	....	[3]2.8 [6]17.3 [9]0.8
*Gillis, Calcasieu Par., se¼ sw¼ 14-9s-8w	180.0	172.4	7	159.1	85.3	27.7	21.6	....	....	35.0	[11]2.7
*Grand Chenier, Cameron Par., 2-39-40 15s-6w	950.0	357.6	[19]2&7	145.7	77.0	29.5	19.7	....	....	43.8	....
CSX NGL Corp.—Bastian Bay, Plaquemines Par., 42-20s-28e	175.0	102.0	7	....	....	....	....	....	103.0	....	....
Blind River, Livingston Par., 35-9s-6e	8.0	4.0	3	....	....	....	....	....	9.0	....	....
Eunice, Acadia Par., sw¼ nw¼-12-7s-2w	1,350.0	1,121.0	[19]2&7	322.0	250.0	86.0	71.0	....	....	158.0	....
Lake Enfermer, LaFourche Par., 9-20s-23e	40.0	22.0	7	....	....	....	....	....	33.0	....	....
Davis, J.L.—White Castle, Iberville Par., 15-10s-13e	7.5	2.5	7	....	....	....	....	....	10.0	....	....
Exxon Co.—Bluewater, Acadia Par., 34-10s-1w	950.0	650.0	6-7	311.0	152.9	53.2	48.8	....	....	101.7	....
Garden City, St. Mary's Par., 45-46-15s-10e	600.0	175.0	2	70.6	43.3	10.7	9.2	....	....	34.9	....
Grand Isle, Jefferson Par., 32-21s-25e	100.0	95.0	7	....	....	....	....	....	170.0	....	[11]1.1
FMP Operating Co.—Chenier No. 1, Vermilion Par., 23-12s-1e	21.0	11.0	7	....	....	....	....	....	36.9	....	....
Gulf Energy Processing Corp.—Lake LaRose, St. Martin Par., 29-9s-8e	16.0	4.3	7	....	....	....	....	5.4	....	....	....
Kerr-McGee Corp.—Bayou Crook Chene, St. Martinville Par., 34-10s-9e	12.5	NR	2	....	....	....	....	....	16.3	....	....
Marathon Oil Co.—Burns Point, St. Mary Par., 10-17s-9e	200.0	62.0	7	....	....	....	....	....	52.0	....	....
Cotton Valley, Webster Par., 26-21n-10w	65.0	23.0	7	27.0	12.2	....	9.2	....	....	8.1	[11]11.2
Mobil Oil Exploration & Producing Southeast Inc.—Cameron Par., 23-15s-13w	310.0	190.0	7	....	....	....	....	....	134.2	....	....
Cow Island, Vermilion Par., 29-13s-2e	950.0	230.0	[26]2	....	....	....	....	....	184.0	....	....
Lowry, Cameron Par., 16-12s-4w	300.0	155.0	7	97.5	48.8	15.6	13.7	....	....	19.5	....
Riverside fractionation, Ascension Par., 8-10s-2e 46-9s-2e	....	....	†	(169.0)	(121.0)	(53.0)	(43.5)	....	....	(72.5)	....
Sea Robin 2, Vermilion Par., 21-13s-14e	150.0	45.0	7	....	....	....	....	....	48.5	....	....
Oxy NGL Inc.—Lake Charles, Calcasieu Par., 19-10s-9w	....	....	†	(378.0)	(225.0)	(82.0)	(64.0)	....	....	(131.0)	....
Petro-Hunt Corp.—Kinder, Allen Par., 23-5s-5w	25.0	4.9	[19]2	....	4.6	....	2.7	....	....	2.1	....
Phillips, Jack L.—Oretta, Beauregard, Par.	3.0	0.5	3	....	....	....	....	....	0.5	....	....
Phillips Petroleum Co.—No. Erath and Grosse Isle, Vermilion Par., sw4 se4 41-13s-4e	45.0	NR	2	....	....	....	....	....	....	....	....
Rollover, Jefferson Davis Par., nw4 22-11s-3w	190.0	NR	[26]2	....	....	....	....	....	....	....	....
Valentine, LaFourche Par., 46-100-17-20e	15.0	NR	7	....	....	....	....	....	....	....	....
Placid Oil Co.—*Black Lake, Natchitoches Par., 14-11n-6w	217.5	186.0	[26]2	....	....	....	....	....	114.5	....	[11]8.0
Patterson II, St. Mary Par., 48-15s-11e	400.0	81.0	7	....	....	....	....	....	68.8	....	....
Resources Extraction & Processing Co.—Bayou Vista 1, St. Mary Par., 11-155-11e	200.0	200.0	7	64.2	24.3	7.6	7.3	....	....	16.0	....
Shell Western E&P Inc.—Barracuda, Cameron Par., 15s-13w	195.0	148.7	7	....	....	....	....	....	185.5	....	....
Black Bayou, Cameron Par., 17-12s-12w	18.0	12.5	2	....	....	....	....	....	3.5	....	....
Calumet, St. Mary Par., 11, 12, 51, 52,-15s-11-3	1,200.0	597.0	2	....	....	....	....	....	290.7	....	....
Crawfish, St. Charles Par., 36-13s-8e	120.0	50.0	7	....	....	....	....	....	48.6	....	....
Elba, St. Landry Par., 4s-7e	1.5	1.7	3	....	....	....	....	....	4.4	....	....
Norco fractionator, St. Charles Par., 6-12s-8e	....	....	†	(576.1)	(405.4)	(107.7)	(114.6)	....	....	(214.8)	....
North Terrebonne, Terrebonne Par., 19,20, 29,33-17s-15e	1,250.0	832.0	2	....	....	....	....	....	817.4	....	....
Stingray, Cameron Par., 33&34-15s-13w	295.0	192.0	2	....	....	....	....	....	108.9	....	....
Tebone fractionator, Ascension Par., 45&46-9s-2e	....	....	†	(212.0)	(273.1)	(80.1)	(81.4)	....	(170.7)	....	....
Toca, St. Bernard Par., 54-14s-14e	830.0	578.0	2&7	....	....	....	....	....	635.8	....	....
Yscloskey, St. Bernard Par., 39-13s-15e	1,850.0	1,277.0	2	....	....	....	....	....	988.6	....	....
Sid Richardson Carbon & Gasoline Co.—Hico-Knowles, Lincoln Par., 9 acres sw¼ of se¼ 10 & nw¼ of ne¼ 15-20n-3w	15.0	3.2	7	....	....	....	....	....	5.6	....	[11]100.0
Sun Exploration & Production Co.—Delhi, Richland Par., 15-17n-9e	22.0	20.5	6	....	5.3	....	4.4	....	....	15.1	....
*Fordoche, Pointe Coupee Par., 41-6s-8e	50.0	30.8	[19]2	....	....	....	....	....	27.5	....	....
*Gillis-English Bayou, Calcasieu Par., 26-8s-5w	20.0	7.7	[19]2	....	....	....	....	....	13.5	....	....

Company, plant, location	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Maurice, Lafayette Par., 31-10s-4e	32.0	25.5	[19]2	....	....	....	....	....	55.7	....	....
South Sarepta, Bossier Par., 21-22n-11w	25.0	10.3	[19]2	....	....	....	....	....	15.2	....	....
Tenneco Oil Processing & Marketing—											
Aymond, St. Mary Par., 13-14s-9e	40.0	17.1	7	....	....	....	....	....	19.7	....	....
Gibson, Terrebonne Par., 77-16s-15e	90.0	70.2	7	....	....	....	....	....	86.4	....	....
Plaquemine, Iberville Par., 46-10s-12e	225.0	110.7	7	....	46.5	15.8	14.8	....	....	34.4	[5]103.0
Sabine Pass, Cameron Par.	200.0	181.2	7	....	....	....	....	....	171.8	....	....
Stephens, Claiborne Par., 6&7-13s-12e	35.0	6.7	2	....	5.3	....	4.9	....	....	4.2	....
St. Landry, Evangeline Par., 35-2s-2e	60.0	62.5	2	....	24.5	....	15.5	....	....	13.8	....
Texaco Inc.—Alligator Bayou, St. Martin Par. sw14 34-10s-9e	27.0	12.8	6&7	....	....	....	....	....	24.2	....	....
Floodway, St. Mary Par., 16-16s-12e	600.0	161.0	6&7	....	....	....	....	....	143.1	....	....
Fordoche, Pointe Coupee Par., 28-6s-8e	5.0	4.5	6-7	....	....	....	....	....	5.5	....	....
Henry, Vermilion Par., 21-13s-4e	803.0	274.0	[37]2	116.3	57.6	20.5	18.5	....	....	50.2	....
Paradis, St. Charles Par., 39-14s-20e	660.0	177.0	6-7 [43]2 6-7	111.7	98.9	22.0	21.3	....	....	41.4	....
Sea Robin, Vermilion Par., 21-13s-4e	900.0	300.0	6-7	....	....	....	....	....	296.5	....	....
Venice, Plaquemines Par., 25&26 21s-30e	65.0	20.5	[46]2	....	....	....	....	....	16.2	....	....
Texas Eastern Transmission Corp.—											
Iowa, Jefferson Davis Par., 18-9s-6w	500.0	331.0	6-7	....	....	....	....	....	158.3	....	....
Pointe au Chien, Terrebonne Par., 18-19s-20e	125.0	11.0	7	....	....	....	....	....	9.3	....	....
Texas Oil & Gas Corp.—Ruston, Lincoln Par., ne4 of nw4 12-19n-4n	30.0	22.2	3	....	....	....	....	....	18.8	....	[11]0.1
Union Texas Petroleum—Cox Bay, Plaquemine Par., 5-18s-16e	20.0	13.7	[19]1	....	3.2	1.0	1.2	....	....	3.3	....
Pointe-a-la-Hache, Plaquemine Par., 78-13s-14e	20.0	9.2	[19]2	....	1.1	0.4	0.4	....	....	1.4	....
Sligo, Bossier Par., 29-18n-11w	70.0	24.8	[19]2	....	10.1	2.1	3.1	....	....	7.0	....
Toca, St. Bernard Par., 56-14s-14e	160.0	103.2	[19]2	....	47.1	14.1	16.5	....	....	33.1	....
Warren Petroleum Co.—Johnson Bayou, Cameron Par., 10 acres 32&33 155-155-13w	NR	0.4	7	....	....	....	....	....	0.3	....	....
Krotz Springs, St. Landry Par., 22-6s-7e	NR	6.1	[19]2	....	5.5	....	3.5	....	....	10.7	[11]10.1
Mermentau, Acadia Par., n½-n½ 70-10s-2w	NR	34.1	[19]2	....	....	....	....	....	54.5	....	....
Vermilion Par., s2 sw4 nw4 28-13s-2e	NR	67.3	7	....	....	....	....	....	90.0	....	....
Venice, Plaquemines Par., 25-21s-30e	NR	351.5	[19]2	140.0	82.8	30.0	31.6	....	43.9	....	[5]163.4
Total	**19,492.5**	**10,766.6**		**1,580.0**	**1,135.4**	**348.9**	**370.1**	**5.4**	**5,658.8**	**668.8**	**420.5**

†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

MICHIGAN

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—Kalkaska Co., 31-27n-7w	180.0	115.2	7	....	39.4	....	....	....	....	84.8	....
ANR Pipeline Co.—*Austin dehydration, Mecosta Co., 4-14n-9w	500.0	138.0	[32]5	....	....	....	....	....	....	....	[11]1.7
*Capac dehyd., St. Clair, 16-7n-13e	300.0	94.0	[13]1	....	....	....	....	....	....	....	....
*C. Charlton-1 sep., Otsego Co., 1-30n-1w	220.0	107.0	3	....	....	....	....	....	....	....	[11]1.6
*Coldwater dehyd., Isabella Co., 29-16n-6w	40.0	16.0	[13]1	....	....	....	....	....	....	....	....
*Croton dehyd., Newaygo Co., 29-12n-11w	50.0	17.0	[13]1	....	....	....	....	....	....	....	....
*Goodwell dehyd., Newaygo Co., 4-14n-11w	385.0	126.0	[32]5	....	....	....	....	....	....	....	[11]1.3
*Lincoln dehyd., St. Clair Co., 20-18n-5w	300.0	89.0	[32]5	....	....	....	....	....	....	....	[11]0.5
*Loreed, Osceola Co., 30-18n-10w	32.0	29.7	3	....	....	....	....	....	1.2	....	....
*Loreed dehyd., Osceola Co., 30-18n-10w	1,000.0	116.0	[13]1	....	....	....	....	....	....	....	....
*Muttonville dehyd., Macomb Co., 13-4n-14e	450.0	63.0	[13]1	....	....	....	....	....	....	....	....
*North Hamilton dehyd., Clare Co., 6-19n-3w	40.0	7.0	[13]1	....	....	....	....	....	....	....	....
*Norwich dehyd., Newaygo Co., 4-14n-11w	50.0	16.0	[13]1	....	....	....	....	....	....	....	....
*Orient dehyd., Osceola Co., 13-17n-7w	50.0	21.0	[13]1	....	....	....	....	....	....	....	....
*Reed City dehyd., Osceola Co., 30-18n-10w	300.0	75.0	[13]1	....	....	....	....	....	....	....	....
*South Chester-15 sep., Otsego Co., 15-29n-2w	270.0	142.0	3	....	....	....	....	....	....	....	[11]2.5
*Winfield dehyd., Montcalm Co., 7-12n-9w	100.0	40.0	[13]1	....	....	....	....	....	....	....	....
Conoco Inc.—Aurelius, Ingham Co., 36-2n-2w	23.0	6.7	[43]2	....	10.6	....	....	†15.7	....	....	[11]10.0
Marathon Oil Co.—Scipio, Hillside Co., 10-5s-3w	38.0	5.5	[1]2	....	21.5	....	....	....	....	19.0	....
Stoney Point, Hillsdale Co., 5-5s-2w	4.5	3.0	3	....	....	....	....	....	4.8	....	....
Michigan Consolidated Gas Co.—											
Romeo, Macomb Co., 14-4n-12e	15.0	11.2	3	....	....	....	....	....	10.2	....	....
Shell Western E&P Inc.—											
Foster 28, Ogemaw Co., 28-24n-2e	15.0	1.9	6	....	....	....	....	....	3.6	....	....
Kalkaska Co., 32-27n-7w	350.0	184.0	2	....	....	....	....	....	688.2	....	....
Sun Exploration & Production Co.—											
*Columbus III, Saint Clair Co., 3-5n-15e	7.4	8.0	3	....	....	....	....	....	7.5	....	....
Mentor, Oscoda Co., 29-25n-3e	9.7	2.8	...	....	....	....	....	....	1.3	....	....
Mt. Pleasant, Isabella Co., 2-14n-3w	3.0	0.6	3	....	....	....	....	....	0.8	....	....
Norwich, Missaukee Co., 12-24n-5w	10.0	3.5	6	....	....	....	....	....	11.7	....	
Williams, Midland Co., 35-15n-2e	1.5	0.4	3	....	....	....	....	....	1.2	....	....
Total	**4,744.1**	**1,439.5**		....	**71.5**	....	....	**15.7**	**730.5**	**103.8**	**17.6**

†Butane-natural gasoline mix.

MISSISSIPPI

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Kerr-McGee Corp.—McComb, Amite Co., 21-4n-6e	2.0	NR	3	....	....	....	....	....	10.0	....	....
Koch Hydrocarbon Co.—Harmony, Clarke Co., 26-2n-14e	30.0	5.9	3	....	7.4	....	5.3	....	....	9.6	....
Shell Western E&P Inc.—											
Goodwater, Clarke Co., 5-10n-8w	15.0	5.2	3	....	1.8	....	2.7	....	....	1.9	....
Tallahala Creek, Smith Co., 5-1n-9e	4.0	4.0	3	....	....	....	....	....	4.0	....	....
Thomasville, Rankin Co., 27-4n-3e	100.0	78.0	[33]1	....	....	....	....	....	....	....	....
Southern Natural Gas Co.—*Muldon, Monroe Co., 27-15e-6e	750.0	302.0	[8]5	....	....	....	....	....	12.1	....	....
Total	**901.0**	**388.7**		....	**9.2**	....	**8.0**	....	**26.1**	**11.5**	....

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other

MONTANA

Company, plant, location	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Coastal Oil & Gas Corp.—Stateline, Richland Co., 7 22n-59e	12.0	3.0	3	....	6.0	....	....	....	5.7	....	[11]0.8
Shell Western E&P Inc.—											
Cabin Creek, Fallon Co., 18-10n-58e	1.9	1.5	3	....	1.7	....	....	4.4	....	....	....
Little Beaver, Fallon Co., 8-4n-62e	0.4	0.3	3	....	0.8	....	....	1.0	....	....	....
South Pine, Wibaux Co., 10-11n-57e	1.2	0.8	4	....	1.9	....	....	3.2	....	....	....
True Oil Co.—Bob Rhodes, Richland Co., ne 4-25n-58e	4.0	0.6	3	....	....	....	....	....	4.2	....	....
Western Gas Processors—Baker, Fallon Co., sw4 sw4 6-7n-60e	2.5	2.0	3	....	13.4	2.2	....	13.5	15.1	2.1	....
Total	**22.0**	**8.2**		....	**23.8**	**2.2**	....	**22.1**	**25.0**	**2.1**	**0.8**

NEBRASKA

Company, plant, location	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Marathon Oil Co.—West Sidney, Cheyenne Co., 4-12n-50w	2.0	1.3	3	....	....	....	....	....	2.7	....	....
Oxy NGL Inc.—Kimball, Kimball Co., 10-12n-55w	1.5	0.9	3	....	....	....	....	....	4.5	....	....
Total	**3.5**	**2.2**		....	....	....	....	....	**7.2**	....	....

NEW MEXICO

Company, plant, location	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—*Empire Abo, Eddy Co., 3-18s-27e	42.0	39.0	7	....	36.9	....	18.1	....	76.5	19.4	....
Conoco Inc.—Maljamar, Lea Co., sw se 21-17s-32e	50.0	18.0	7	38.0	35.0	5.1	11.9	....	....	9.2	[11]7.3
San Juan Co., 14-29n-11w	500.0	474.0	7	....	....	....	....	....	1,670.0	....	....
Davis, J.L.—Denton, Lea Co., 2-7-155-37e	15.0	6.0	7	....	....	....	....	....	42.0	....	....
El Paso Natural Gas Co.—Blanco, San Juan Co., n2-n2 14-29n-11w	558.0	465.6	4	....	....	....	....	....	....	....	....
Chaco, San Juan Co., sw4 16-26n-12w	594.0	257.8	[18]2	....	....	....	....	....	359.0	....	....
Jal No. 3, Lea Co., nw4-sw4 33-24s-37e	225.0	61.2	[19]2	....	....	....	....	....	68.6	....	....
Wingate, McKinley Co., 16&17-15n-17w	....	....	†	....	(320.0)	(82.6)	(157.3)	....	....	(189.1)	....
Marathon Oil Co.—Indian Basin, Eddy Co., 23-21s-23e	180.0	72.5	7	....	....	....	....	....	118.1	....	[11]11.9
Mesa Limited Partnership—South Blanco Creek, 6-7w-23n	6.0	2.8	3	....	....	....	....	....	12.5	....	....
Minerals Inc.—Hobbs, Lea Co., sw¼-sw¼-ne¼ 36-18s-36e	45.0	NR	7	....	....	....	....	....	44.1	....	....
Kermac, Eddy Co., 4-21s-31e	6.0	NR	6	....	....	....	....	....	1.6	....	....
Northern Natural Gas Co.—Hobbs, Lea Co., 6-19s-3 e	220.0	75.1	[40]2	....	....	....	....	....	127.1	....	....
Oxy NGL Inc.—Bluitt, Roosevelt Co., 15-8s-36e	27.5	18.7	7	....	....	....	....	....	0.1	....	....
Phillips Petroleum Co.—Artesia, Eddy Co., s2 se4 7-18s-28e	43.0	NR	7	....	....	....	....	....	....	....	....
Eunice, Lea Co., ne4 3-22s-37e	80.0	NR	7	....	....	....	....	....	....	....	....
Lee, Lea Co., sw4 se4 30 nw4-ne4-31-17s-35e	35.0	NR	7	....	....	....	....	....	....	....	....
Lusk, Lea Co., nw4 ne4 19-19s-32e	60.0	NR	2	....	....	....	....	....	....	....	....
Sunterra Gas Processing Co.—											
Kutz No. 1, San Juan Co., nw4 13-28n-11w	140.0	42.4	2	....	....	....	....	....	89.6	....	....
Kutz No. 2, San Juan Co., nw4 13-28n-11w	85.0	70.0	7	....	....	....	....	....	206.3	....	....
Lybrook, Rio Arriba Co., nw¼ 14-23n-7w	85.0	40.5	7	....	....	....	....	....	74.8	....	....
Texaco Inc.—Buckeye, Lea Co., se¼ of se¼ 36-17s&18s-34e, I mi se of Buckeye	25.0	5.5	6	....	....	....	....	....	63.2	....	....
Texaco Producing Inc.—Eunice No. 1, Lea Co., 27-22s-37e	105.0	74.9	7	175.6	112.0	11.8	35.2	....	....	47.4	[11]2.1
Warren Petroleum Co.—											
Eunice, Lea Co., ne4 3-22s-37e	NR	51.1	7	....	....	....	....	....	241.8	....	....
Monument, Lea Co., sw4 36-19s-36e	NR	61.2	7	....	16.8	....	....	....	234.4	....	....
Saunders, Lea Co., 34-14s-33e	NR	25.1	6	....	....	....	....	....	189.5	....	....
Vada, Lea Co., sw2-sw4-nw4 23-10s-33e	NR	10.2	6	....	....	....	....	....	68.6	....	....
Total	**3,310.8**	**2,107.1**		**213.6**	**200.7**	**16.9**	**65.2**	....	**3,687.8**	**76.0**	**21.3**

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†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

NORTH DAKOTA

Company, plant, location	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Cenex—Coyote Creek, Bowman Co., 131n-104w-27	3.0	0.6	[19]2	....	1.3	....	2.5	....	....	....	....
Koch Hydrocarbon Co.—Grasslands, McKenzie Co., 36-148n-105w	70.0	51.8	7	....	87.5	....	52.4	....	....	62.0	....
Oxy NGL Inc.—Lignite, Burke Co., nw4 7-162n-91w	11.0	6.3	2	....	12.7	....	7.0	....	....	7.0	....
Phillips Petroleum Co.—Tioga, Williams Co., 26-157n-95w	105.0	NR	2	....	....	....	....	....	....	....	....
True Oil Co.—Red Wing Creek, McKenzie Co., ne 27-148n-101w	10.0	1.7	3	....	....	....	....	....	10.8	....	....
Warren Petroleum Co.—Little Knife, Dunn Co., 16-141n-98w	NR	27.2	7	....	59.3	....	....	....	60.4	....	....
Western Gas Processors Ltd.—Alexander, McKenzie Co., e½ sw¼ sw¼ 18-152n-101w	6.0	3.0	3	....	....	....	....	....	....	....	[11]1.9
Teddy Roosevelt, Billings Co., nw4-ne4 16-142n-99w	65.0	36.2	2&7	....	35.2	....	26.2	....	....	33.6	[11]10.9
Temple, Williams Co., Lot 4, 30-159n-95w.	4.0	3.0	3	....	....	....	....	....	12.4	....	[11]0.3
Total	**308.0**	**213.8**		....	**196.0**	....	**88.1**	....	**83.6**	**102.6**	**13.1**

OKLAHOMA

Company, plant, location	Gas capacity	Gas through-put	Process/condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—											
Hitchcock-Okeene, Blaine Co., 13-17n-11w.	55.0	33.0	7	....	....	....	....	....	85.0	....	[11]1.4

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Mooreland, Woodward Co., 30-23n-18w	145.0	46.0	7	....	....	....	....	....	100.4	....	[11]4.7
Anadarko Production Co.—											
Beaver Co., se 25-6n-21ecm	8.0	2.2	7	....	....	....	....	2.4	....	....	....
North Richland Center, Texas Co., 33-6n-12ecm	25.0	5.9	[46]2	....	6.1	....	....	....	4.9	....	....
Arco Oil & Gas Co.—											
Covington, Garfield Co., w2-sw4 19-22n-3w	15.0	15.4	7	15.8	18.8	2.8	7.8	....	....	9.6	[11]0.2
Drumright, Creek Co., nw4 sw4 28-18n-7e	15.0	4.8	[19]1	0.3	11.5	2.0	6.0	....	....	9.7	[11]0.3
Tecumseh, Pottawatomi Co., sw¼ 36-9n-3e	5.0	8.0	3	1.6	14.9	1.9	6.4	....	....	7.3	[11]0.6
Arkla Inc.—Elk City, Beckham Co., 2-10n-21w	10.0	0.4	[31]5	....	....	....	....	....	....	....	....
Beard Oil Co.—Bentley, Payne Co., 22-18n-1e	1.0	0.2	3	....	....	....	....	....	0.5	....	....
*Choctaw, Oklahoma Co., 23-12n-1w	3.0	1.0	3	....	....	....	....	....	2.5	....	....
Cabot Transmission Corp.—Beaver Co., 25-5n-23ecm	20.0	6.0	7	....	....	....	....	....	16.2	....	....
CNG Producing Co.—Southwest Davis, 15-15s-1e	2.0	0.6	3	....	....	....	....	....	3.9	....	....
Coastal Oil & Gas Corp.—Custer Co., ne4 5-13n-17w	200.0	132.0	7	....	....	....	....	....	141.2	....	....
Colorado Interstate Gas Co.—Keyes, Cimarron, e2 of se4 17-5n-7e	30.0	9.2	3	....	....	....	....	....	....	3.1	....
Conoco Inc.—											
Cashion, Kingfisher Co., ne ne 9-15n-5w	30.0	19.4	7	13.4	12.8	1.9	6.0	....	....	8.1	[11]0.4
Clinton, Custer Co., sw 26-12n-16w	75.0	70.2	7	122.1	63.3	11.2	15.1	....	....	18.7	[11]0.2
Hennessey, Kingfisher Co., nw nw 36-19n-7w	30.0	29.8	7	55.4	38.3	5.1	13.9	....	....	14.8	[11]1.7
Mustang, Grady Co., 30-10n-5w	30.0	27.0	7	45.7	25.3	3.3	9.2	....	....	11.1	[11]0.6
Damson Gas Processing Corp.—Hooker, Texas Co., 8-4n-17e	70.0	35.6	7	....	....	....	....	....	106.8	....	....
Deisenroth Gas Products Inc.—Okemah, Okfuskee Co., 23-11n-9e	1.0	0.9	[22]1	....	....	....	....	....	3.0	....	....
El Paso Natural Gas Co.—*Beaver Co., se4-ne4 18-3n-26e	40.0	4.9	3	....	....	....	....	....	5.6	....	....
Enogex Production Corp.—											
Calumet, Canadian Co., ne4 28-14n-9w	NR	46.0	[19]2	....	31.0	4.7	8.1	....	....	9.7	....
Dibble, McClain Co., 35-7n-4w	NR	0.6	3	0.9	1.4	0.2	0.8	....	....	1.0	....
Edmond, Okla. Co., 32-14n-4w	NR	4.7	7	14.7	15.2	2.1	6.0	....	....	51.0	....
Henryetta, Okmulgee Co., 33-13n-12e	NR	3.1	6	2.4	4.2	0.8	2.0	....	....	2.0	....
Wellston, Lincoln Co., 3-13n-2e	...	...	6	2.6	3.3	0.5	1.3	....	....	1.7	....
Enserch Processing Partners Ltd.—											
Wallville, Garvin Co., 27-4n-3w	6.0	2.3	[3]2	....	....	....	....	....	2.6	....	....
Exxon Co.—Camargo, Dewey Co., 10-18n-19w	15.0	6.4	[19]2	....	7.9	....	....	....	6.3	....	....
Dover-Hennessey, Kingfisher Co., 1-18n-7w.	80.0	47.4	7	....	....	....	....	....	216.6	....	....
Gulf Energy Gathering & Processing—											
Antioch, Garvin Co., 17-3n-2w	10.0	3.9	3	....	....	....	....	13.9	....	....	....
Pauls Valley, Garvin Co., 12-3n-1w	0.1	0.1	3	....	....	....	....	0.9	....	....	....
West Guthrie, Logan Co., 30-15n-2w	10.0	13.6	3	....	....	....	....	27.8	....	....	....
Kerr-McGee Corp.—											
Marlow, Stephens Co., 18-2n-7w	2.0	NR	3	....	....	....	....	....	4.0	....	....
Milfay, Creek Co., 21-15n-7e	12.0	NR	2	....	....	....	....	....	14.4	....	....
Koch Hydrocarbon Co.—Fitts, Pontotoc Co., 30-2n-7e	12.0	1.1	3	....	1.3	....	....	....	3.8	....	....
Ladd Petroleum Corp.—Beaver Co., 30 4n-20ecm	40.0	28.2	7	....	....	....	....	....	52.7	....	....
Marathon Oil Co.—Cox City, Grady Co., se4 17-3n-5w	3.0	2.5	3	....	....	....	....	....	1.7	....	....
Maxus Exploration Co.—Roger Mills ¼ 21-w-15	30.0	20.0	7	....	....	....	....	....	51.0	....	....
McMoRan Oil & Gas Co.—Tyrone, Texas ~~Co.~~, sw¼ 19-6n-19 ecm	36.0	21.0	7	....	....	....	....	....	51.0	....	....
Meridian Companies Inc.—											
Enterprise, Payne Co., ne¼ 25-18n-5e	5.0	1.0	3	....	....	....	....	....	1.0	....	....
HJD, Pawnee Co., nw¼ 7-20n-8e	6.0	2.0	3	....	....	....	....	....	6.5	....	....
Lincoln Gas, Lincoln Co., se¼ 2-14n-5e	5.0	1.5	4	....	....	....	....	....	....	....	....
Meridian Energy, Lincoln Co., sw¼ 1-14n-5e	10.0	2.0	3	....	....	....	....	....	8.0	....	....
Mid-America, Pawnee Co., e½ 30-20n-8e	5.0	1.0	3	....	....	....	....	....	3.0	....	....
Patriot, Creek Co., w½ 7-17n-8e	3.0	1.0	3	....	....	....	....	....	1.2	....	....
Poll Gas, Lincoln Co., e½ 23-14n-2e	10.0	7.0	3	....	....	....	....	....	8.8	....	....
Triok, Lincoln Co., sw¼ 18-14n-4e	3.0	1.2	3	....	....	....	....	....	2.5	....	....
Mesa Limited Partnership—											
Binger, Caddo Co., 26-10n-11w	15.0	5.3	7	....	....	....	....	....	22.1	....	....
Madill, Marshall Co., 32-7e-5s	25.0	10.7	[1]2	....	15.8	1.5	5.1	....	....	1.3	....
Ringwood, Major Co., 11-22n-10w	80.0	46.4	[1]2&7	....	....	....	....	....	138.3	....	....
Mobil Oil Corp.—											
Chitwood, Grady Co., 34-5n-6w	90.0	52.9	7	....	....	....	....	....	203.0	....	....
NE Trail, Dewey Co., 1-17n-18w	34.0	20.9	[1]2	....	....	....	....	....	40.0	....	....
Postle Hough, Texas Co., 13-5n-13ecm	18.5	2.0	[1]2	....	....	....	....	....	12.0	....	....
*Putnam-Oswego, Dewey Co., 35-16n-16w	50.0	40.1	7	....	....	....	....	....	52.0	....	....
*Seiling, Woodward Co., 32-20n-17w	20.0	0.7	3	(All products fractionated at NE Trail)							
Sholem Alechem, Stephens Co., 2-1s-4w	70.0	36.2	7	....	....	....	....	....	181.0	....	....
Oklahoma Gas Pipeline Co.—Tyrone, Texas Co., sw¼ 11-6n-18e	60.0	44.0	7	11.8	22.7	5.0	11.5	....	....	14.8	....
Oxy NGL Inc.—											
Ambrose, Kay Co., sw4 9-27n-1w	400.0	140.1	2	4.0	70.0	12.0	25.0	....	....	21.0	[5]4.8
Garrett, Kay Co., ne4-ne4 34-27n-1e	12.0	5.6	4	....	....	....	....	....	17.6	....	....
Murdock, Texas Co., 32-5n-16ecm	40.0	7.2	7	....	....	....	....	....	22.0	....	....
Rodman, Garfield Co., 27-20n-8w	40.0	33.0	7	....	....	....	....	....	118.0	....	....
Phillips Petroleum Co.—Aline, Alfalfa Co., 7-23n-11w	45.0	NR	2	....	....	....	....	....	....	....	....
Bradley, Garvin Co., ne4 nw4 18-4n-4w	140.0	NR	1	....	....	....	....	....	....	....	....
Cimarron, Woodward Co., e2 ne4 27-20n-17w	56.0	NR	7	....	....	....	....	....	....	....	....
Creek, Tulsa Co., s2 sw4 nw4 7-17n-13e	25.0	NR	7	....	....	....	....	....	....	....	....
Fox, Carter, Co., 28-2s-3w	70.0	NR	7	....	....	....	....	....	....	....	....
Kingfisher Co., nw4 sw4 9-15n-5w	175.0	NR	7	....	....	....	....	....	....	....	....
Lucien, Noble Co., 18-20n-2w	22.0	NR	3&7	....	....	....	....	....	....	....	....
Norge, Grady Co., ne4 3-6n-8w	27.0	NR	3	....	....	....	....	....	....	....	....

Company, plant, location	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Okarche, Kingfisher Co., se4 ne4 31-15n-8w	150.0	NR	7	....	....	....	....	....	....	....	....
Osage Co., se4 32-26n-7e	15.0	NR	3	....	....	....	....	....	....	....	....
Seiling, Dewey Co.	75.0	NR	7	....	....	....	....	....	....	....	....
Sooner No. 1, Major Co., se4 se4 17-20n-9w	12.0	NR	3	....	....	....	....	....	....	....	....
Standard Oil Production Co.—											
Crescent, Logan Co., nw 34-17n-4w	45.0	26.9	6	....	....	....	....	138.0	....	....	....
*Elmore, Garvin Co., 17-1n-2w	30.0	28.1	7	....	5.6	....	5.8	....	....	10.3	[5]49.7
Marshall, Garfield Co., nw 24-20n-4w	15.0	9.8	7	....	....	....	....	49.3	....	....	....
Sun Exploration & Production Co.—											
Burlington, Alfalfa Co.	3.0	1.8	3	....	....	....	....	....	1.8	....	....
Carney, Lincoln Co., 12-15n-2e	15.0	16.7	7	....	....	....	....	....	62.1	....	....
Goldsby Central, McClain Co., 3-7n-3w	65.0	49.6	7	....	....	....	....	....	212.0	....	....
Laverne, Harper Co., 20-26n-25w	200.0	71.3	7	....	39.7	10.1	20.7	....	....	24.3	[5]130.3 [11]5.9
Norge, Grady Co.	5.0	4.5	3	....	....	....	....	....	21.2	....	....
Wakita, Grant Co., 5-27n-7w	15.0	13.9	[19]2	....	....	....	....	....	35.9	....	[11]1.9
Texaco Inc.—Enville, Love Co., 7-7s-3e	15.0	8.5	7	....	....	....	....	....	16.9	....	....
Maysville, Garvin Co., 18-4n-2w	114.0	106.7	7	256.8	125.4	13.9	54.0	....	....	54.9	....
Texaco Producing Inc.—											
Camrick, Beaver Co., 31-1n-20 ecm	14.0	3.6	7	....	....	....	....	....	17.4	....	....
*East Velma Middle Block, Stephens Co., 1-2s-4w	30.0	19.8	[19]2	....	....	....	....	....	....	....	....
Kellyville, Creek Co., ne 27-17n-10e	15.0	0.8	6	....	....	....	....	....	2.2	....	....
Velma, Stephens Co., 23-ls-5w	100.0	52.7	7	....	....	....	....	....	243.4	....	....
Texas Oil & Gas Corp.—											
Antelope Hills, Roger Mills Co., 30-16n-24w	50.0	46.1	7	....	....	....	....	....	72.2	....	[11]0.6
Beaver Co., 9-1n-27e	50.0	38.0	7	....	....	....	....	....	65.2	....	[11]1.0
Cimarron, Blaine Co., nw4 24-18n-13w	90.0	12.8	7	....	....	....	....	....	20.6	....	[11]0.8
Custer Co., sw4 nw4 34-14n-16w	105.0	73.0	[19]2&7	....	....	....	....	....	146.5	....	[11]4.0
El Reno, Canadian Co., nw4 sw4 33-14n-7w	75.0	41.6	7	....	....	....	....	....	95.1	....	[11]5.2
Watonga, Kingfisher Co., w2 se4 35-15n-9w	40.0	...	7	....	....	....	....	....	....	....	[11]0.2
Woodward Co., sw4 nw4 29-23n-21w	75.0	36.2	7	....	....	....	....	....	57.9	....	[11]1.5
Union Pacific Resources—Enid, Garfield Co., 34-23n-6w	35.0	18.0	[19]2	....	....	....	....	58.8	....	11.5	....
Union Texas Petroleum Corp.—											
Chaney Dell, Major Co., 35-23n-10w	130.0	93.6	[19]2&7	92.7	87.3	13.5	32.7	....	....	54.4	....
Chester, Woodward Co., 2-20n-17w	25.0	20.8	6-7	18.4	15.0	2.7	6.1	....	....	8.4	....
Lamont, Grant Co., 19-26n-3w	30.0	25.7	7	61.6	48.7	6.0	17.0	....	....	19.0	....
Unocal—Caddo, Carter Co., 23-36-1e	10.0	3.8	3	....	4.5	....	....	....	4.2	....	[11]0.3
Valero Hydrocarbons Co.—											
Elk City, Beckham Co., 15-10n-21w	85.0	76.1	7	17.6	24.2	4.8	9.2	....	9.3	....	....
Tecumseh, Pottawatomie Co., ne4 29-10n-3e	14.0	10.8	3	10.3	15.1	2.0	6.3	....	5.0	....	....
Warren Petroleum Co.—											
Kingfisher Co., 11-15n-9w	NR	6.4	7	....	....	....	....	....	15.5	....	....
Knox, Grady Co., 33-3n-5w	NR	14.4	[19]2	....	3.6	....	....	....	11.5	....	[11]6.8
Leedey, Roger Mills Co., 32-16n-21w	NR	34.1	7	....	....	....	....	....	119.2	....	....
Mocane, Beaver Co., 18-5n-25e ecm	NR	42.9	[19]2	....	....	....	....	....	93.9	....	....
Total	**4,571.4**	**2,785.0**		**748.1**	**732.8**	**108.0**	**276.0**	**291.1**	**3,040.1**	**387.7**	**223.1**

PENNSYLVANIA

Tembec Co.—Waynesburg, Greene Co.	14.0	7.9	3	....	4.1	....	3.3	....	....	3.9	....
Waynesburg, Greene Co.	....	....	†	....	(2.5)	....	(1.7)	....	....	(1.5)	....
Total	**14.0**	**7.9**		....	4.1	....	**3.3**	....	....	**3.9**	....

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†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals).

TEXAS

Adobe Resources Corp.—Sale Ranch, Martin Co., 23-37-1n	16.0	11.2	[19]2	....	....	....	....	....	77.0	....	....
Amoco Gas Co.—Texas City, Galveston Co., 1.814 acre tract in John Grant A-72	60.0	48.0	7	....	....	....	....	....	13.8	....	[5]17.0
Amoco Production Co.—											
Anton-Irish, Hale Co., 14-DT HE&WT RR	12.0	2.0	3	....	....	....	....	....	9.9	....	....
Cedar Lake, Gaines Co.	2.0	1.0	[4]2	....	....	....	....	....	10.0	....	....
Edgewood, Van Zandt Co., 2 Roberts A-702	60.0	31.0	[19-40]2	....	11.2	5.5	7.9	....	....	8.4	[11]38.3
Hastings, Brazoria Co., 1-ACH-DA-416	70.0	68.0	7	....	....	....	....	....	33.6	....	[5]8.8
Mallett CO_2 removal, Hockley Co., Labors 16, 17 League 49 Scurry Co. School Land	140.0	37.0	1-5	....	....	....	....	....	....	29.9	....
Midland Farms, Andrews Co., 842-T-T-N G&MMB&A	15.0	25.1	7	....	....	....	....	....	151.7	....	[10]4.0
Monahans, Winkler Co., 24-10 PSL	5.0	4.0	3	....	....	....	....	....	8.1	....	....
North Cowden, Ector Co., 34-5-43-1M T&P RR	25.0	18.0	7	....	26.5	....	61.9	....	....	....	[5]40.7 [11]104.0
Old Ocean, Brazoria Co., Charles Breen League A-46	175.0	108.0	7	63.7	33.8	10.0	9.3	....	....	36.1	....
Slaughter, Hockley Co., 14-15-59 Edwards & Scurry CSL	57.0	46.0	7	....	119.7	....	86.7	....	....	93.9	[5]187.6
South Fullerton, Andrews Co., 8-A 48 PSL	10.0	9.0	7	....	....	....	....	....	84.4	....	[10]0.3
Wasson ODC CO_2, Yoakum Co., 805-D, JH Gibson Survey	80.0	24.0	2	....	....	....	....	....	42.0	....	....
West Yantis, Wood Co., 3 Oscar Engledon A-181	25.0	9.0	3	....	....	....	....	....	....	....	[10]35.7
Arco Oil and Gas Co.—*Block 31, Crane Co., 33-31 Univ. Lands	265.0	284.7	3&7	192.4	137.5	11.6	65.6	....	....	61.9	....
Carthage	...	...	3	0.6	0.9	1.0	0.8	....	....	2.9	....
*Crane, Upton Co., 128-D CCS&RR Co.	15.0	10.9	3	9.4	10.3	1.6	4.8	....	....	5.1	[11]0.4
Crittenden, Winkler Co., 24-C23-PSL	50.0	6.9	7	7.9	3.6	0.8	1.0	....	....	2.0	....
El Dorado, Schleicher Co., 81-TT-TC RR	15.0	15.9	7	36.6	26.9	4.4	9.8	....	....	7.7	[11]4.9
Fashing, Atascosa & Karnes Co., 131 Wm. Smith	12.0	3.6	[19]5	....	0.2	....	0.3	....	....	0.7	....
Hull, Liberty Co., Wm. Smith A-342	18.0	1.4	[19]2	....	0.2	....	0.1	....	....	0.4	[11]0.1

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Longview, Gregg Co., J. Moseley	35.0	8.6	7	45.0	60.7	7.1	32.1	....	....	28.1	[11]1.3
Nueces River, Live Oak Co., Cameron CSL 32-A-34	90.0	74.7	3	....	26.4	....	21.2	....	....	17.4	....
Price, Rusk Co., George W. Brooks A-4	15.0	2.3	3-7	1.5	3.9	1.1	2.8	....	....	4.9	[11]0.5
Refugio Co., 48&48A Coleman Fulton Pasture Land	6.5	0.7	3	....	....	....	0.5	....	....	....	....
Silsbee, Hardin Co., George W. Brooks A-4	15.0	11.8	7	18.5	17.0	4.0	5.0	....	....	4.9	....
Taft, San Patricio Co., Coleman Fulton Pasture Land	40.0	14.4	[26]2	....	4.6	....	3.4	....	....	3.2	[11]0.6
Arkla Inc.—Jefferson, Marion Co., Heirs of John Hanks A-188	3.0	0.6	3	....	....	....	....	....	0.4	....	....
Waskom, Harrison Co., J. Blair	65.0	NR	3	....	....	....	....	....	20.0	....	....
Willow Springs, Gregg Co., P. P. Rains	10.0	NR	3	....	....	....	....	....	6.5	....	....
Associated Natural Gas Inc.—Wilcox, Lavaca Co., JR Ragsdale A-377	235.0	55.0	2	8.5	8.5	....	5.5	....	....	5.5	....
BHP Petroleum—Diamond M, Scurry Co., se¼ 182-97 H&TC	18.0	13.0	6	43.2	58.2	8.0	23.4	....	....	22.6	[11]0.9
Black Hawk Gasoline Corp.—Jack Co., R. Stanton, A-1329	1.5	0.5	3&4	....	....	....	....	1.6	....	....	....
Bruin Petroleum Inc.—Clarkson, Sutton Co.	NR	20.0	7	....	....	....	....	....	30.0	....	....
Hainesville, Wood Co.	NR	4.0	3	....	....	....	....	....	8.0	....	....
Trinidad, Henderson Co.	1.5	0.7	3	....	....	....	....	....	2.0	....	....
Urbana, San Jacinto Co.	NR	1.2	3	....	....	....	....	....	2.0	....	....
Cabot Transmission Corp.—											
Arrington, Hemphill Co., 62-A-2 H&GNRR	40.0	25.4	2	....	....	....	....	....	13.8	....	....
Carson Co., 4-5-I&GN	20.0	14.3	7	....	....	....	....	....	65.8	....	....
East Goldsmith, Ector Co., 44-34, 1n,T&PRR	35.0	9.3	2&7	....	....	....	....	....	14.5	....	....
Estes, Ward Co., 3-16 Univ. Land	11.5	8.2	7	....	....	....	....	....	51.5	....	....
Gray Co., 152-3 I&GN	20.0	14.2	7	....	....	....	....	....	81.8	....	....
Kingsmill, Gray Co., 152-3-I&GN	24.5	12.5	7	....	....	....	....	....	87.8	....	....
Levelland, Hockley Co., 14-43, Rains County School Land	15.0	5.1	7	....	....	....	....	....	5.9	....	....
Turkey Creek, Potter Co., 36-M20-G&M	40.0	20.6	2	....	....	....	....	....	75.3	....	....
Walton, Winkler Co., 11-26 PSL	33.5	25.5	7	....	....	....	....	....	100.2	....	....
Chevron USA Inc.—Kermit, Winkler Co., 12-B3 PSL	50.0	9.0	2	....	5.8	....	2.6	....	....	5.2	....
Clajon Gas Co., A&M, Burleson Co., John P. Coles A-12	50.0	28.8	7	....	....	....	....	....	127.9	10.7	....
La Grange, Fayette Co., James Green A-189	200.0	75.8	7	....	....	....	....	....	276.9	40.8	....
Conoco Inc.—Chittim, Maurice Co., 35-6	5.0	1.3	3	....	3.6	....	4.8	....	....	2.7	....
Hamlin, Fisher Co., 9-R-26	15.0	7.7	7	22.4	26.2	4.1	10.5	....	....	9.2	[11]3.4
Ramsey, Reeves Co., nw½ 36-58-1	10.0	8.0	6	....	12.0	....	6.7	....	....	5.4	....
Damson Gas Processing Corp.—											
Caddo, Stephens Co., 77 T&P RR 5	1.0	0.8	4	....	....	....	....	....	4.0	....	....
Canadian, Hemphill Co.	3.0	0.5	3	....	....	....	....	....	0.9	....	....
Cargray, Carson Co., 46-4 I&GN	30.0	11.0	7	16.3	12.8	....	....	....	20.4	....	....
Ibex, Shackelford Co., nw¼ 28 BAL	10.0	5.0	[10]1	....	9.7	....	3.3	....	....	5.9	....
South Bend, Young Co., J. Garrett	10.0	5.0	[10]1	....	9.7	....	3.3	....	....	5.9	....
Sterling Co., 10-22 H&TC	30.0	21.3	6	....	....	....	....	....	53.0	....	....
Woodlawn, Harrison Co.	100.0	13.3	[19]1	....	....	....	....	....	20.0	....	....
Davis Gas Processing Inc.—Big Lake, Reagan Co., 8 miles e of Big Lake	12.0	9.5	[19]2	....	....	....	....	....	48.0	....	....
Bowie, Montague Co., 3 miles ne of Bowie	8.0	3.5	3	....	7.0	....	....	....	8.0	....	....
Concho, Concho Co., 4 miles s of Paint Rock	10.0	3.5	[19]2	....	3.5	....	....	....	3.5	....	....
DeWees, Wilson Co., 10 miles sw of Floresville	2.0	0.8	3	....	....	....	....	....	2.4	....	....
Irion (Rocker B-2), Irion Co., 8 miles n of Barnhart	16.0	8.0	[19]2	....	....	....	....	....	45.0	....	....
Neleh, 5 miles sw of McCamey	6.0	3.5	2	(Gas processed at Shell's Tippett plant)							
Ozona, Crockett Co., 13 miles sw of Ozona	5.0	2.0	3	....	....	....	....	....	4.0	....	....
Stiles, Reagan Co., 5 miles nw of Texon	8.0	3.5	[19]2	....	....	....	....	....	22.0	....	....
Davis, J.L.—Claytonville, Fisher Co., 211-3 H&TC RR, 12 mi n of Roscoe	12.0	4.0	6	....	....	....	....	....	28.0	....	....
Peach Creek, Lavaca Co., A-32	15.0	3.0	7	....	....	....	....	....	7.5	....	....
Pearsall, Frio Co., 1-A-307 Henry Castro	8.0	3.0	3	....	....	....	....	....	12.0	....	....
Diamond Shamrock Corp.—McKee, Moore Co., 399-44 H&TC	375.0	227.3	[24-33]2&7	....	214.9	44.1	108.3	....	120.2	....	[5]364.1 [5]13.8
Eagle Petroleum Corp.—Eagle-Thriftway, Young Co.	0.5	0.2	3	....	....	....	....	....	1.4	....	....
Holliday No. 2, Archer Co.	1.5	0.5	3	....	....	....	....	....	1.9	....	....
El Paso Hydrocarbons Co.—											
Benedum, Upton Co., w2 46 Y MK&T RR	90.0	88.0	7	....	....	....	....	....	416.0	....	....
*Foster, Ector Co., 125 acres sw18-42: TSS T&PRR	20.0	13.0	7	....	....	....	....	....	119.0	....	....
Santa Rosa, Pecos Co., s2 105 8 H&GN RR	20.0	15.0	7	....	....	....	....	....	62.0	....	....
El Paso Natural Gas Co.—Midkiff, Reagan Co., nw4 n2 sw4-22 T&PRR 37-5-5	168.0	67.4	[19]1	81.0	162.8	....	70.8	....	....	61.3	....
Wilshire, Upton Co., e2 ne4 ne4 & ne4 se4 ne4 135E CCSD & RGNG RR	30.0	21.6	4	....	....	....	....	....	3.1	....	....
Endevco Natural Gas Co.—Bear Wallow Brazoria Co., Oliver Jones A-78	50.0	25.0	7	....	....	....	....	....	55.0	....	....
Catarina, Grimes Co.	12.0	7.0	3	....	....	....	....	....	12.0	....	....
Gun Point, Dewitt Co.	80.0	30.0	[7]1	....	....	....	....	....	....	....	....
Seven Sisters, Duval Co.	30.0	10.0	[7]1	....	....	....	....	....	....	....	....
Enerfin Partners I Ltd.—											
Bailey, Schleicher Co., 522-TT	15.0	11.6	7	....	....	....	....	....	81.2	....	....
Eldorado, Schleicher-Irion-Reagan Cos., 33-M-GH&SA	35.0	36.6	7	....	....	....	....	....	64.2	....	....
Mertzon, Schleicher-Irion-Tom Green Cos., Tom Green CSL-1	50.0	21.3	7	....	....	....	....	....	148.5	....	....
Quitman, Wood Co., S.G. Purse A-456	10.0	3.5	3	....	....	....	....	....	18.6	....	....
Enron Gas Processing Co.—											
DuBose, Gonzales	35.0	5.0	[21]1	....	....	....	....	....	....	....	[11]0.2
Encinal, Webb Co.	35.0	28.4	7	....	12.0	....	9.0	....	....	7.0	....

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Gregory, San Patricio Co., Geranimo Valdez A-269	70.0	47.8	[19-26]2	....	28.0	....	19.0	....	....	9.0	[11]0.6
Imperial, Crane Co., 20&21 1 H&TC RR-1	18.0	15.0	7	....	....	....	....	....	49.0	....	[11]0.5
Lipan, Hood Co., J.R. Anderson A-11	15.0	8.0	7	....	....	....	....	....	36.0	....	
McMullen Co.	15.0	9.5	3	....	14.0	....	11.0	....	....	7.0	....
Martin Co. No. 1, 31-37-2n TYP RR	10.0	9.0	3	....	....	....	....	....	47.0	....	....
Martin Co. No. 2 4-HA	5.0	3.0	3	....	....	....	....	....	16.0	....	....
Middle Concho, sw4 90-14 H&TC RR Co.	10.0	2.9	6	....	....	....	....	....	15.0	....	....
Robstown, Nueces Co., Mathis Garcia A-116	80.0	58.4	[19-26]2	10.0	20.0	....	14.0	....	....	9.0	[11]0.3
Sonora, Sutton Co., HE&WT RR A-352	55.0	60.1	[19-26]2	....	12.0	....	20.0	....	....	11.0	....
Victoria Co., James Reed A-236	60.0	35.5	[19-26]2	....	9.0	....	7.0	....	....	7.0	[11]0.1
Enserch Processing Partners Ltd.—											
Chico, Jack Co., J.U. Fields A-218	30.0	16.3	7	....	....	....	....	....	116.4	....	....
Decatur, Wise Co., David Moses A-357	18.0	11.3	7	....	....	....	....	....	44.6	....	....
Gilliland, Knox Co., C of H&TC RR	14.0	1.3	3	....	....	....	....	....	1.9	....	....
Gordon, Palo Pinto Co., Thomas Reed A-384	50.0	32.6	7	....	....	....	....	....	117.4	....	....
Madisonville, Madison Co., Alfred Gee A-16	20.0	14.2	[32]5	....	....	....	....	....	1.9	....	....
Novice, Coleman Co., T&NO RR Co. 24-2	4.5	3.8	3	....	....	....	....	....	5.4	....	....
Pueblo, Eastland Co., SPRR-464	20.0	15.9	7	....	....	....	....	....	90.0	....	....
Ranger, Eastland Co., H&TC RR 4-4	18.0	19.9	3	....	....	....	....	....	111.1	....	....
Reprieve, Hardeman Co., L. Bechtol, 2	3.0	1.5	3	....	....	....	....	....	7.6	....	....
Santa Anna, Coleman Co., Mary Ann Fisk 630, A-195	5.0	2.7	3	....	....	....	....	....	2.8	....	....
Springtown, Parker Co., JL Hodges A-690	80.0	51.4	7	....	162.1	....	....	....	....	....	....
Trinidad, Henderson Co., No. Addison A-17.	65.0	60.1	7	....	92.6	....	....	....	....	....	....
Exxon Co.—Clear Lake, Harris Co., James Lindsey A-43	150.0	126.0	[19]2	....	....	....	....	....	102.0	....	....
*Conroe, Montgomery Co., Ransom House	125.0	120.0	[19]2	....	....	....	....	....	97.6	....	....
Cordona Lake GCF, Crane Co., nw¼ Juan Cordona Survey	10.0	...	4	(Hydrocarbon and CO_2 mix. CO_2 is reinjected).							
East Texas, Rusk, T. J. Martin	25.0	5.9	3&6	....	4.7	....	....	....	45.3	....	[5]40.7
Hawkins, Wood Co., H. Watson	110.0	108.0	[19]2	17.0	38.5	17.5	24.0	....	....	57.0	....
Hawkins Cryogenic, Wood Co., H. Watson	30.0	27.0	7	10.4	9.5	4.0	4.7	....	....	9.7	....
Heyser, Calhoun Co., Agaton Sisneros A-36	30.0	18.0	7	2.9	0.9	0.4	0.4	....	....	1.4	....
Katy, Waller Co., T. S. Reese 110, A-332	960.0	275.0	[19]2	351.5	135.4	....	154.4	....	....	....	....
King Ranch, Kleberg Co., R. King A-172	1,000.0	554.0	[19]2	406.5	134.3	45.5	39.3	....	....	102.4	....
Means GCF, Andrews Co., PSL A-35 nw corner of 12	40.0	33.0	4	(Hydrocarbon and CO_2 mix. CO_2 is reinjected)							
Neches, Cherokee Co., J. H. Shaw	30.0	28.0	[19]2	....	....	....	....	....	39.9	....	....
Pyote, Ward Co., 32-16 ULS	100.0	42.0	7	....	....	....	....	....	61.2	....	....
Sabine Lake, Orange Co., Wm. A. Davis A-7	20.0	18.7	7	....	....	....	....	....	61.6	....	....
Sandhills, Crane Co., 18-32 PSL	65.0	23.0	7	....	....	....	....	....	101.3	....	....
Sarita, Kenedy Co., J. A. Balli A-2	95.0	42.0	7	24.6	12.9	5.4	4.6	....	....	9.0	....
Thompson, Fort Bend Co.	68.0	60.0	4	....	....	....	....	....	....	....	....
Tomball, Harris Co., C. Goodrich	60.0	23.4	[19]2	....	....	....	....	....	18.5	....	....
Tom O'Connor, Refugio Co., Maria Ximines A-324	165.0	139.0	7	31.2	16.5	7.6	8.1	....	....	29.0	....
Trawick, Nacogdoches and Rusk Cos.	135.0	65.0	[35]1	....	....	....	....	....	....	....	....
Fort Chadbourne Corp.—Box Elmdale, Callahan Co., 4 miles e of Abilene	4.0	2.0	3	....	....	....	....	....	4.0	....	....
Tuscola, Taylor Co., 2 miles w of Tuscola	4.0	3.0	3	....	....	....	....	....	6.0	....	....
GGSI Gathering & Processing Co.—Apple Creek, Glasscock Co., 7-32-4s	30.0	16.9	7	....	....	....	....	....	125.8	....	....
Gulf Energy Gathering & Processing—											
*Runge, Karnes Co., Cabeza Creek area, Ramon Musquiz A-8	52.0	28.4	[19]2	....	....	....	....	46.9	....	....	....
Hunt Oil Co.—*Fairway, Henderson Co., Jose Mora A-497	87.5	65.0	[1-40]2	....	....	....	....	....	136.4	....	....
*Pecos Valley, Pecos Co., 106-T&ST-L	10.0	3.0	3	....	....	....	....	....	2.8	....	....
Kerr-McGee Corp.—Chapel Hill #35, Smith Co., Stillwell Box A-169	35.0	NR	7	....	13.5	....	10.3	....	15.9	....	....
Hobart Ranch, Hemphill Co., 70 A-2 N&GN	43.5	NR	7	....	....	....	....	....	83.1	....	....
Ladd Petroleum Corp.—Southwest Ozona, Crockett Co., 2-2 HGN RR 28 mi sw of Ozona township	23.0	17.0	[19]1-[26]2	....	....	....	....	74.3	....	....	....
Mapco Westpan Inc.—Bivins, Moore Co., 33-PMc, ELRR	100.0	12.8	[46]2	....	....	....	....	....	33.0	....	....
Fritch 950, Hutchinson Co., 92-Y2-TTRR	60.0	40.0	[45]2	....	....	....	....	....	153.0	....	....
Marathon Oil Co.—Markham, Matagorda Co., 4-9-9	21.0	18.0	3	....	....	....	....	4.3	....	....	....
Susan Peak, Tom Green Co., 193 SPRR-11	3.3	2.9	3	....	....	....	....	....	6.3	1.0	....
Welder, San Patricio Co., 49 Robert Montgomery 199 and Ewan Cameron A-97	55.0	7.0	1	....	....	....	....	....	1.6	....	....
*Yates, Pecos Co., I.G. Yates, 194 SF 1234-1	72.0	72.1	3-7	....	....	....	....	....	65.5	....	[11]2.7
Mesa Limited Partnership—Fain, Potter Co., G&M 10-181-B	80.0	36.7	7	....	....	....	....	....	127.3	....	....
Mills Bennett Estate—Brooks Co., El Tule Grant A-257	8.0	1.7	3	....	....	....	....	1.2	....	....	....
Mitchell Energy & Development Corp.—											
Alabama Ferry, Madison Co.	5.0	1.3	3	....	....	....	....	....	4.7	....	....
Barton Chapel 1, Jack Co.	15.0	9.6	7	....	....	....	....	....	38.1	....	[11]0.1
Barton Chapel 2, Jack Co.	20.0	13.3	7	....	....	....	....	....	50.9	....	[11]0.1
Bridgeport 1, Wise Co.	150.0	93.5	7	....	....	....	....	....	474.9	....	[11]7.6
Bridgeport 2, Wise Co.	20.0	12.5	7	....	....	....	....	....	67.0	....	[11]2.2
Bridgeport 3, Wise Co.	20.0	12.5	7	....	....	....	....	....	67.0	....	[11]2.2
Bryan Hicks, Brazos Co.	20.0	18.4	7	....	....	....	....	....	81.7	....	....
Cisco, Eastland Co.	15.0	8.8	7	....	....	....	....	....	46.5	....	[11]0.1
Gum Island, Jefferson Co.	40.0	9.6	7	....	....	....	....	....	30.3	....	....
Huckabay No. 1, Erath Co.	15.0	10.3	7	....	....	....	....	....	38.8	....	<[11]0.1
Huckabay No. 2, Erath Co.	15.0	10.3	7	....	....	....	....	....	38.8	....	<[11]0.1
Huckabay No. 3, Erath Co.	15.0	10.3	7	....	....	....	....	....	38.8	....	<[11]0.1
Lone Camp No. 2, Palo Pinto Co.	10.0	5.3	7	....	....	....	....	....	29.5	....	[11]0.2
Lone Camp No. 3, Palo Pinto Co.	10.0	5.3	7	....	....	....	....	....	29.5	....	<[11]0.2
Lone Camp No. 4, Palo Pinto	30.0	16.2	7	....	....	....	....	....	88.4	....	[11]0.6
Mineral Wells, Palo Pinto Co.	15.0	9.9	7	....	....	....	....	....	53.2	....	[11]0.6

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Morgan Mill No. 1, Erath Co.	15.0	4.5	7	....	....	....	....	....	14.7	....	<[11]0.1
Morgan Mill No. 2, Erath Co.	15.0	4.5	7	....	....	....	....	....	14.7	....	<[11]0.1
Morgan Mill No. 3, Erath Co.	20.0	5.9	7	....	....	....	....	....	19.7	....	<[11]0.1
Ponder, Denton Co.	2.0	1.7	7	....	....	....	....	....	4.5	....	<[11]0.1
Port Arthur, Jefferson Co.	115.0	93.6	7	....	....	....	....	....	81.3	....	....
Schreiner Ranch, Live Oak Co.	20.0	8.5	7	....	....	....	....	....	26.3	....	[11]<0.1
Seven Oaks, Polk Co.	20.0	4.0	[26]2	....	....	....	....	....	6.8	....	[11]<0.1
Sheffield, Pecos Co.	15.0	8.6	7	....	....	....	....	....	21.6	....	....
Springtown, Parker Co.	15.0	9.2	7	....	....	....	....	....	25.8	....	....
Wellborn, Brazos Co.	5.0	1.5	3	....	....	....	....	....	81.1	....	....
Winnie, Jefferson Co.	75.0	61.9	7	....	....	....	....	....	58.2	....	....
Mobil Exploration-Producing U.S. Inc.—											
*Coyanosa, Pecos Co., 48-OW TTRR	140.0	105.0	7	....	....	....	....	16.7	144.6	....	[11]66.9
East Canadian, Hemphill Co., David Crockett	50.0	10.4	7	....	....	....	....	....	33.0	....	
East White Point, San Patricio Co., G.H. Paul subdiv. of Coleman Fulton Pasture Lands	25.0	11.0	7	....	....	....	....	...	22.5	....	....
Electra, Wilbarger Co., 17-13 H&TC RR	1.2	0.8	3	....	....	....	....	...	12.6	....	....
Feldman, Hemphill Co., H&TC RR 42-44	3.0	3.0	6&3	....	....	....	....	....	6.3	....	....
LaGloria, Jim Wells Co., 9-3 Rangeland 7 Herring subdiv. LaGloria Townsite subdiv	318.0	174.0	7	176.6	91.8	29.3	25.1	....	....	61.6	[11]11.0
*Lake Creek, Montgomery Co.	5.5	5.4	7	2.0	2.3	0.6	0.9	....	....	1.5	....
*Pegasus, Midland Co., e2 30-40-4s T&PRR	90.0	84.0	7	77.7	....	....	....	....	165.9	....	....
*Portillo, San Patricio Co., M. S. Welder	15.0	18.0	2	3.8	4.4	1.7	2.1	....	....	6.5	....
Salt Creek, Kent Co., W&NW RR G-193	28.0	12.7	3	....	....	....	....	....	131.7	....	....
Vanderbilt, Jackson Co., R. Musquex A-59	58.0	44.4	2	....	....	....	....	....	....	....	[5]6.9 [9]1.4 [8]12.7
Waha, Pecos Co., 5-C3 PSL	125.0	54.0	7	....	....	....	....	....	117.6	....	[11]1.7
Natural Gas Pipeline Co. of America—											
CP 170, Moore Co., w½ of nw¼ section 1 of TTRR	80.0	42.0	7	....	....	....	....	....	136.7	....	....
Oxy NGL Inc.—Chico, Wise Co., 3 GH&HRR A-384	100.0	74.5	7	....	....	....	....	....	468.0	....	[11]7.0
East Texas, Gregg Co., William Castleberry A-38	22.0	18.7	7	....	....	....	....	85.0	....	....	[5]114.0
Flatrock Creek, Young Co., 6 acres, M. Case A-1402, (File 8 NGL 2630)	10.0	9.6	2	....	....	....	....	....	27.0	....	....
Graham, Young Co., 4 acres e 53⅓ acres subdiv 15 TE&L A-3412 (File 10-NGL 2631)	7.0	3.5	3	....	....	....	....	....	6.0	....	....
Gulf Coast fractionation, Chambers Co., Henry Griffin, League A-12	....	....	†	(997.0)	(819.0)	(171.0)	(358.0)	....	....	(357.0)	....
Lefors, Gray Co., 2-1-ACH&B	11.6	8.3	7	....	....	....	....	82.0	....	....	....
Markley, Archer Co., 2 acres in A. Rohns A-240 (File 10 NGL 2634)	2.0	0.5	3	....	....	....	....	....	1.0	....	....
Mont Belvieu fractionation, Chambers Co., Henry Griffin, League A-12	....	....	†	(816.0)	(713.0)	(157.0)	(347.0)	....	....	(275.0)	....
Myrtle Springs, Van Zandt Co., J. Salingua A-765	25.7	20.7	2	....	19.0	....	20.0	....	....	0.9	[11]103.0
*Roberts Ranch, Midland Co., 16-41-3s T&PRR	85.0	65.4	7	....	....	....	....	....	157.0	....	....
Robstown, Nueces Co., Andres de la Fuente A-3 Simmons & Perry subdiv 7	8.0	6.6	7	....	....	....	....	....	13.0	....	....
Stonewall Co., Elijah Boren A-831	12.0	5.4	1	....	16.5	....	9.0	....	....	8.0	....
Welch, Dawson Co., 67 M, EL&RR	2.5	1.2	2	....	....	....	....	....	14.0	....	....
*West Seminole, Gaines Co., 335 GCSD & RGNG RR	30.0	18.0	7	....	....	....	....	....	79.0	....	....
Permian Operating Ltd. Partnership—											
Possum Kingdom, Stephens Co., E. Romerhausen A-149	5.0	2.0	3	....	....	....	....	....	5.4	....	....
Todd, Crockett, 28-WX GC&SF RR	5.0	2.6	3	....	....	....	....	....	10.0	....	....
Phillips, Jack L.—Nan Su Gail, Freestone Co.	7.0	1.0	3	....	....	....	....	....	1.3	....	....
Phillips Petroleum Co.—Andrews Co., w2 nw4 19-A 46 PSL	115.0	NR	1-2&6	....	....	....	....	....	....	....	....
Birthright, Hopkins Co., Linecum A-561 and Hargrave A-426	30.0	NR	3	....	....	....	....	....	....	....	....
Brazoria Co., nw4,5 HT&B A-221	55.0	NR	2&7	....	....	....	....	....	....	....	....
Crane Co., ne4 216-F CCSD&RGNG RR	20.0	NR	7	....	....	....	....	....	....	....	....
Dumas, Moore Co., nw4-181-44 H&TC	120.0	NR	7	....	....	....	....	....	....	....	....
East Chapa, Live Oak Co., Chapa A-697	50.0	NR	7	....	....	....	....	....	....	....	....
Fullerton, Andrews Co., Center S-17 A-32 PSL	55.0	NR	7	....	....	....	....	....	....	....	....
Giddings, Fayette Co., David G. Green A-193	75.0	NR	7	....	....	....	....	....	....	....	....
Goldsmith, Ector Co., nw4-se4-33-44 T&P-1n	82.0	NR	7	....	....	....	....	....	....	....	....
Gray Co., e2-32-2 H&GN	74.0	NR	2	....	....	....	....	....	....	....	....
Luling, Caldwell Co., north corner John Henry A-12	12.0	NR	2&7	....	....	....	....	....	....	....	....
Pantex, Hutchinson Co., 8&9 M. Whitley	20.5	NR	2&7	....	....	....	....	....	....	....	....
Puckett, Pecos Co., n2 26-101 TCRR	250.0	NR	5	....	....	....	....	....	....	....	....
Quarry, Washington Co., Nelson-Whitehead A-108	75.0	NR	7	....	....	....	....	....	....	....	....
Rock Creek, Hutchinson Co., nw4-22-y A&B	180.0	NR	7	....	....	....	....	....	....	....	....
Sherman, Hansford Co., 7&8-1 PSL	340.0	NR	7	....	....	....	....	....	....	....	....
Sneed, Moore Co., w2-nw4 Freeman Brazemore	250.0	NR	1	....	....	....	....	....	....	....	....
Spraberry, Midland Co., se4-25 3s-37 T&P	25.0	NR	7	....	....	....	....	....	....	....	....
Portal Drilling Co.—McMullen Co., Benjamin Odlum A-9	2.2	2.0	3	....	....	....	....	....	5.4	....	....
Pronto Gas Products Inc.—Archer City, Archer Co.	1.0	0.1	3	....	....	....	....	....	0.6	....	....
Moran, Shackelford Co.	2.0	1.0	3	....	....	....	....	....	2.5	....	....

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Wall, Tom Green Co.	0.8	0.1	3	....	....	....	....	....	1.4	....	....
Seagull Energy Corp.—Matagorda Co., Lot 29 Moore Pasture subdivision	250.0	205.0	7	94.2	46.9	23.6	12.7	....	....	34.4	....
Shannon Energy Corp.—Mobeetie, Wheeler Co., 46-B&K A-5 H&GN	12.0	2.0	[19]2	....	....	....	....	....	1.0	....	....
Shell Smackover Ltd.—Eustace, Henderson Co. Vincente Michelli A-485	70.0	25.0	7	....	....	....	....	....	104.8	....	....
Shell Western E&P Inc.—Armadillo, Pecos Co., GC&SF R-3-5	2.0	0.1	3	....	....	....	....	....	0.3	....	....
Big Foot, Frio Co.	0.5	0.3	3	....	....	....	....	....	2.1	....	....
*Bryans Mill, Cass Co., B.F. Lynn A-651	70.0	54.0	2	....	28.5	....	....	40.8	....	....	....
Denver Unit CO_2, Yoakum Co., nw¼ 827 sw¼ 802-D John H. Gibson	70.0	64.0	2	....	....	....	....	....	85.5	....	....
Fandango, Zapata Co.	90.0	89.0	[29]1	....	....	....	....	....	....	....	....
Houston Central, Colorado Co., F. Mayhar A-400 K. Winn A-589	700.0	537.0	2-7	382.2	244.0	57.9	65.2	....	....	113.7	[11]33.3
Tippett, Crockett Co., 38-31-H&TC RR	55.0	22.0	6	41.9	27.9	....	....	36.2	....	....	....
TXL, Ector Co., 17-45-1s T&P RR	40.0	24.0	2	48.8	49.5	....	22.9	....	....	21.4	[11]0.5
Wasson, Yoakum Co., nw¼ 827 sw¼ 802-D John H. Gibson	95.0	62.0	2	39.8	105.0	....	....	167.5	....	....	[11]1.3
Sid Richardson Carbon & Gasoline Co.—Chalk, Cottle Co., nw¼ of C.L. Carter FP 4480	15.0	8.1	3	....	....	....	....	....	16.2	....	[11]1.9
Eskota, Fisher Co., 11 T&PRR-19	12.0	7.1	6	....	....	....	....	....	70.0	....	[11]0.1
Halley, Winkler Co., e2-22-B11-PSL	60.0	31.9	7	....	....	....	....	....	103.0	....	[11]1.3
Keystone, Winkler Co 5-B2 & 1&2 B3-PSL	120.0	89.5	7	....	....	....	....	....	237.5	....	[11]1.4
Sterling Co., 11 acres 2-31-5s T&P RR	40.0	16.7	7	....	....	....	....	....	78.5	....	....
Southwest Forest Gas Gathering Co.—Rocker B 1, Reagan Co., 17 miles ne Big Lake	16.0	5.0	7	....	....	....	....	....	30.0	....	....
South Texas Energy Systems LP—											
Kosciusko, Wilson Co., I mile n of Kosciusko, Tex.	8.0	3.0	3	....	....	....	....	....	5.0	....	....
SPG Exploration Corp.—Martha F. Berry, Frio Co., M.C. Patton, 1178 A-542	5.0	3.0	6	....	....	....	....	....	7.0	....	....
Ozona, Crockett Co., nw¼ BMN GC&SF RR	60.0	25.0	[19]2	....	33.0	....	15.5	....	....	8.0	....
Sun Exploration & Production Co.—Big Wells, Dimmitt Co., I&GN A-223 82-1	20.0	5.5	[19]2	....	6.5	....	4.7	....	....	1.7	....
*Desdemona, Eastland Co.	NR	1.0	3	....	....	....	....	....	6.1	....	....
Jameson, Coke Co., 315-1A N&TCRR	70.0	31.6	6&7	....	49.4	....	45.5	....	....	33.8	[5]156.1 [11]1.0
Snyder, Scurry Co., 16-1 JP Smith	50.0	44.7	7	....	86.8	64.3	....	....	209.5	70.6	[11]0.8
Sun, Starr Co., 239 AB-225 CCSDR RGN GRR	92.0	101.0	[19]2	....	32.6	....	34.1	....	41.4	....	[5]71.6
Tijerina-Canales, Jim Wells Co., 343 CCSD&R GNG RR A-119	40.0	23.4	[19]2	....	7.3	....	8.1	....	....	4.3	[5]24.5
Tenneco Oil Processing & Marketing—											
Chesterville, Colorado Co., Thomson A-708	80.0	14.8	2	....	....	....	....	....	12.3	....	....
Magnolia City, Nueces Co.	60.0	52.4	7	....	....	....	....	....	83.2	....	....
McAllen Ranch, Hidalgo Co.	26.0	23.4	2	....	....	....	....	....	44.5	....	....
Texaco Inc.—Bradford Ranch, Midland Co., 13-39-3s, T&P RR	16.0	15.5	7	....	....	....	....	....	67.2	....	....
Burleson Co., JP Coleson A-12	30.0	7.0	6-7	....	....	....	....	....	35.0	....	....
Encinitas, Brooks Co., nw¼ San Antonio Grant A-214	32.0	4.2	[41]2	....	....	....	....	....	8.2	....	....
George West, Live Oak Co., G.W. West sub D 200&201	23.0	22.6	6-7	....	....	....	....	....	69.8	....	....
Handy, Grayson Co., se¼ I&GN RRA-1441	12.0	1.3	[19]2	....	....	....	....	....	9.2	....	....
*Headlee Devonian, Ector-Midland Co., ne¼ of nw¼ 29-41-2s T&PRR	190.0	190.0	7	....	....	....	....	....	517.0	....	....
Luby, Nueces Co., Canutillo Colony Dutch Co.	20.0	13.2	6-7	....	....	....	....	....	14.9	....	....
Mabee, Andrews Co., s¼ 32-40-2n, G&MMB&A	5.0	2.6	6	....	....	....	....	....	9.7	....	....
Ozona, Crockett, n½ 3-MN, GC&SF RR	25.0	10.7	7	....	....	....	....	....	43.4	....	....
South Kermit, Winkler Co., sw¼ 22 B-3, PSL	42.0	11.9	7	....	9.2	....	....	....	25.4	....	....
Streetman, Freestone Co., A-536, Jefferson Richards	7.5	3.5	6-7	....	....	....	....	....	18.2	....	....
Texaco Producing Inc.—											
East Vealmoor, Howard Co., 20-27-H&TC	50.0	37.1	[19]2	120.5	147.5	17.4	56.1	....	....	60.1	....
Fuller, Scurry Co., ne¼ 652-97 H&TC RR	5.0	4.4	3	....	....	....	....	....	52.6	....	....
McLean, Gray Co., 68-23 H&GN RR	26.0	11.8	7	....	....	....	....	....	23.9	....	....
*Schafer, Carson Co., 8/3-4-1n I&GN RR	55.0	28.4	[1]1&7	....	....	....	....	....	182.9	....	....
Spearman, Ochiltree Co., 23-R-B&B	50.0	34.3	2	....	12.2	....	....	....	12.7	....	....
Texas Oil & Gas Corp—											
Coyanosa, Pecos Co., 18-143-T&SL RR.	75.0	46.7	7	....	....	....	....	....	90.7	....	[11]0.6
Denton Co., BBB&CRR A-161	30.0	9.9	[19]2	....	....	....	....	....	32.4	....	....
East Texas, Marion Co., John H. Kemels A-236	75.0	27.1	7	....	9.1	....	9.0	....	....	6.5	[11]0.4
Grapeland, Houston Co., 2 JDJ Procella League A-69	165.0	31.3	7	....	....	....	....	....	20.1	....	....
Laredo, Webb Co., Porcion 14 of N.D. Hachar Estate	30.0	13.9	[19]2	....	....	....	....	....	17.4	....	[11]0.4
Longview, Gregg Co., Frost Thorn A-5	100.0	33.5	7	....	....	....	....	....	13.0	....	[5]17.8 [11]0.1
Shackelford, Callahan Co., nw corner 24 sw corner 23 Bayland Orphan Home Land	30.0	10.1	[19]2	....	....	....	....	....	32.0	....	....
Three Rivers, Live Oak Co., J.D. Jamison 168 A-268	25.0	9.3	7	....	....	....	....	....	23.5	....	[11]1.1
Union Pacific Resources—Bryan, Brazos	35.0	17.0	6	....	....	....	....	....	72.6	....	....
Conger, Glasscock Co.	6.0	3.4	3	....	....	....	....	....	4.7	....	....
*Conroe, Montgomery Co.	65.0	64.7	7	....	....	....	....	....	79.1	....	....
East Texas, Panola Co.	380.0	309.8	7	....	4.4	....	0.5	....	231.3	115.4	[5]325.6
Gulf Plains, Nueces	85.0	61.6	7	66.5	30.0	....	19.0	....	....	48.0	....
Lyons 1 & 2, Burleson Co.	25.0	12.3	3	....	....	....	....	....	53.1	....	....
Tunis, Burleson Co.	15.0	7.7	3	....	....	....	....	....	40.8	....	....
Union Texas Petroleum Corp.—Benedum, Upton Co., Sect. G, C. Bendle A-657	30.0	30.8	7	94.4	67.4	7.8	23.7	....	....	27.6	....

Company, plant, location	MMcfd Gas capacity	Gas throughput	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
East Sour Lake, Hardin Co., 384 A-784 J.F. Keith	20.0	17.5	7	7.7	14.7	4.8	4.5	....	....	6.0	....
Noel, Eastland Co., ne 4 31-3 H&TC RR	30.0	17.9	7	51.5	40.1	5.3	13.6	....	....	14.7	....
Perkins, Coke Co., 2-H&TC RR	25.0	21.0	7	55.4	51.2	7.8	19.1	....	....	19.3	....
Walnut Bend, Grayson Co., E.L. Stickney A-1089	10.0	5.6	7	15.4	13.9	2.1	5.6	....	....	6.1	....
Wellman, Terry Co.	6.0	2.3	7	3.1	8.6	1.4	4.4	....	....	4.6	....
United Texas Transmission Co.—Galveston Bay, Chambers Co., J. Armstrong A-2	40.0	13.5	7	....	....	....	....	....	7.5	....	[11]0.2
Unocal—Dollarhide, Andrews Co., 25-A52-PSL	13.0	4.1	6	....	....	....	....	....	36.4	....	....
*Fort Trinidad, Houston Co., RCS A-23	40.0	12.5	[38]2	....	11.4	....	8.3	....	....	4.9	....
Van, Van Zandt Co., JWS A-891	15.0	10.2	[38]2	....	6.9	....	10.3	....	....	12.0	....
Upham Oil & Gas Co.—Bridgeport, Wise Co., Wm. Hersee	12.0	7.0	[1]2	....	8.1	....	5.7	....	6.1	....	....
Valero Hydrocarbons Co.—Armstrong, DeWitt Co. James A. Moody A-333	400.0	336.1	2-7	256.0	157.8	34.6	47.1	....	56.9	....	....
Freer, Webb Co. BS 1-4 A-1954	190.0	126.4	2	23.9	40.1	11.1	10.7	....	17.3	....	....
Garden City, Sterling Co., 30-22, A-698 H&TC RR	40.0	52.3	3-7	97.5	92.1	10.6	28.7	....	19.2	....	....
Gilmore, Hidalgo Co., TexMex RR A-211	90.0	71.4	7	68.5	29.1	10.2	8.4	....	18.7	....	....
Ozona, Crockett Co., 10 45- DP GC&SF RR	20.0	NR	5-7	1.0	1.2	0.2	0.4	....	0.6	....	....
San Martin, Bexar Co. 4010 F. Farias 15 A-2	150.0	183.0	7	105.2	78.4	20.3	29.1	....	40.7	....	....
Shoup, Nueces Co., AB&M 409 A-555	300.0	276.4	3-7	189.7	94.4	31.2	27.2	....	51.0	....	....
Sonora, Sutton Co., 122, HE&WTRR A-1117	44.0	26.5	7	27.2	21.8	3.5	7.0	....	7.2	....	....
Sterling plant and field, 11 2-31-5 South T&PRY	40.0	15.7	3-5-7	22.8	20.7	2.5	6.3	....	3.9	....	....
Warren Petroleum Co.—											
Breckenridge, Stephens Co., n2 22 LAL	NR	11.1	7	....	....	....	....	....	61.3	....	....
Canadian, Hemphill Co., 216 G&MMB&A-C	NR	8.8	7	....	....	....	....	....	19.3	....	....
Como, Hopkins Co., Nacogdoches Univ. A-703	NR	18.7	7	....	21.7	....	18.8	....	....	11.1	[11]37.5
Fashing, Atascosa and Karnes Cos., Emma Tar H. et al, tract in James Wilkerson 149 A-882	NR	33.1	[19]2	....	10.7	....	6.8	....	....	14.2	....
Gladewater, Gregg Co., David Ferguson	NR	5.8	7	....	....	....	....	....	39.6	....	§41.7
McLean, Wheeler Co., 33-24 H&GN RR	NR	6.6	6	....	....	....	....	....	44.2	....	....
Monahans, Ward Co., 4-F	NR	22.3	7	....	....	....	....	....	91.1	....	....
Moores Orchard, Fort Bend Co., German Emigration No. 8 A-117	NR	6.8	7	....	....	....	....	....	12.1	....	....
Sand Hills, Crane Co., 21-PSL B-21	NR	94.0	[19]2&7	....	....	....	....	....	424.0	....	....
Shackelford Co., TE&L 522 & 523	NR	8.0	7	....	....	....	....	....	54.2	....	....
Sherman North, Grayson Co., Uriah Burns A-121	NR	6.7	[19]2	....	6.9	....	....	....	6.6	....	....
Sherman South, Grayson Co., James S. Coffee A-232	NR	1.6	4	....	....	....	....	....	....	....	....
Snyder North, Scurry Co., ne4 440 H&TCRR B-97	NR	16.4	7	....	....	....	<0.1	....	102.5	....	....
Spear, Gregg & Rusk Co., Mary Van Winkler	NR	1.4	7	....	....	....	9.7	....	....	....	§7.8
Tolar, Hood Co., Lewis Boatright A-33	NR	0.6	4-[23]5	....	....	....	....	....	....	....	....
Tonkawa, Hemphill Co., 78-41 H&TC RR	NR	1.8	3	....	....	....	....	....	1.5	....	....
Worsham, Ward Co., 56-34 H&TC RR	NR	5.8	7	....	....	....	....	....	12.1	....	....
WW Sub Inc.—*Markley, Jack Co., SPRR A-583	2.0	1.0	3	....	....	....	....	....	3.2	....	....
Total	**17,802.2**	**11,422.7**		**3,474.4**	**3,595.0**	**531.9**	**1,524.0**	**556.5**	**11,904.0**	**1,458.1**	**1,936.8**

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† Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). §Butane-gasoline mix.

UTAH

Company, plant, location	MMcfd Gas capacity	Gas throughput	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Chevron USA Inc.—Red Wash, Uintah Co., ne4 21 nw4 22-7s-23e	7.0	5.0	[7]2	....	....	....	....	....	2.5	....	[11]100.8
Coastal Oil & Gas Corp.—*Altamont, Duchesne Co., 34-1s-4w	40.0	13.0	3	....	10.6	....	8.5	....	....	17.3	[11]3.1
El Paso Natural Gas Co.—Aneth, San Juan Co., nw4-6-41s-24e	100.0	12.5	[17]1	....	....	....	....	....	71.1	....	....
Gary Energy Corp.—Altonah, Duchesne Co., sw-nw 5-2s-3w	12.5	1.4	3	....	0.6	....	0.6	....	....	1.7	....
Bluebell, Duchesne Co., sw-nw 23-1s-2w	23.0	12.7	[19]2	....	12.5	....	....	....	22.9	....	....
Koch Hydrocarbon Co.—Cedar Rim, Duchesne Co., 21-35-6w	12.0	5.3	3	....	3.7	....	3.3	....	6.1	....	....
Marathon Oil Co.—Tin Cup Mesa, San Juan Co., 25-38s-25e	1.0,	1.4	3	....	....	....	....	....	4.2	....	....
Mountain Fuel Resources Inc.—Price, Carbon Co., 8-14s-10e	120.0	77.7	3	....	....	....	....	....	3.1	....	....
Union Pacific Resources—Pineview, Summit Co., 3-2n-7e	10.0	2.5	3	....	4.7	....	....	....	14.3	....	....
Yellow Creek, Summit Co. 16-3n-8e	80.0	55.5	7	....	32.2	....	....	....	21.8	....	....
Unocal—*Lisbon, San Juan Co., 22-30s-24e	80.0	59.1	3	....	21.8	....	14.2	....	....	18.2	....
Total	**485.5**	**246.1**		....	**86.1**	....	**26.6**	....	**146.0**	**37.2**	**103.9**

WEST VIRGINIA

Company, plant, location	MMcfd Gas capacity	Gas throughput	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Columbia Gas Transmission Corp.—Cobb, Kanahwa Co., Big Sandy district	35.0	28.0	[19]2	....	....	....	....	....	36.5	....	....
Kenova, Wayne Co., Ceredo district	140.0	123.0	[19]2	....	....	....	....	....	133.0	....	....
CNG Transmission Corp.—Hastings, Wetzel Co.	150.0	124.2	3	223.9	140.5	24.0	45.4	....	45.3	....	....
Gulf Energy Gathering & Processing—											
Copley Run, Lewis Co.	40.0	26.8	7	....	....	....	....	34.8	....	....	....
Schultz, Pleasants Co.	10.0	8.1	7	....	....	....	....	24.0	....	....	....
West Union, Doddridge Co.	15.0	11.4	7	....	....	....	....	21.8	....	....	....
Pennzoil Producing Co.— 9 small plants	9.0	4.5	4	....	....	....	....	....	....	1.7	....
Total	**399.0**	**326.0**		**223.9**	**140.5**	**24.0**	**45.4**	**80.6**	**214.8**	**1.7**	....

WYOMING

Company, plant, location	MMcfd Gas capacity	MMcfd Gas throughput	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Amoco Production Co.—*Anschutz Ranch East, Uinta Co., 26-24-35 13n-121w 6PM	330.0	500.0	7	....	....	....	....	....	1,067.8	....	[11]1,470.0
Beaver Creek, Fremont Co. 10-33n-96w	65.0	23.0	[19-42]2	....	11.6	....	9.7	....	....	8.0	....
Beaver Creek Phosphoria, Fremont Co., 10-33n-96w	14.0	7.0	4	....	....	....	....	....	....	....	[11]6.5
Elk Basin, Park Co., 29-48n-99w	17.0	10.0	[19-44]2	....	18.3	....	14.5	....	....	19.1	....
Painter NRU-NGL, Uinta Co., sw¼ 32 16n-119w	240.0	104.0	7	....	....	....	....	....	....	868.2	[11]21.0
Whitney Canyon, Uinta Co., 17-17n-119w	275.0	163.0	7	....	....	....	....	....	137.2	....	[11]125.8
Arco Oil & Gas Co.—Gillette, Campbell Co., 18-50n-73w	31.0	2.4	3	....	....	7.6	4.2	....	....	3.5	[11]0.2
Riverton Dome, Fremont Co., 36-1s-4e	30.0	5.7	[26]2	....	....	....	....	....	....	3.0	....
Chevron USA Inc.—Carter Creek, Uinta Co., 6-18n-119w	150.0	130.0	[7]2	....	....	....	....	....	81.9	....	[11]121.8
Colorado Interstate Gas Co.—Rawlins, Carbon Co., sw4-sw4 25-21n-86w	200.0	169.8	2	....	43.8	....	49.9	....	....	31.7	....
Enerfin Partners I Ltd.—Gillette, Campbell Co., 1-49n-74w	6.0	1.7	3	....	3.7	....	....	....	4.5	....	....
Enron Gas Processing Co.—Painter, Uinta Co. nw4 6-15n-119w	35.0	71.6	3	....	....	....	....	....	134.0	....	....
Exxon Co.—Shute Creek, Lincoln Co., 22n-112w-14	480.0	480.0	[29-35]1 [29]2 [23]5 6-7	(Hydrocarbon and CO_2 mix. CO_2 reinjected).							
KN Energy Inc.—Casper, Natrona Co., 10-33n-78w	80.0	43.2	1	....	13.0	....	4.2	....	....	3.1	....
Flat Top, Converse Co., 20-33n-68w	5.0	1.6	1	....	2.4	....	....	2.7	....	....	....
Lawrence-Allison & Associates West Inc.—NPR 3 Teapot Dome, Natrona Co., swne 4 38n-78w	10.0	11.0	[26]3	....	4.8	....	....	....	....	8.8	....
Marathon Oil Co.—Oregon Basin, Park Co., 29-51n-100w	6.5	5.0	3	....	....	....	....	....	14.5	....	....
Rock River, Carbon Co., 34-19n-78w	0.5	0.2	3	....	....	....	....	....	0.4	....	....
Northwest Pipeline Corp.—Moxa Arch, Lincoln Co., 19-19n-112w	30.0	21.1	[31]5	....	....	....	....	....	2.4	....	....
Opal, Lincoln Co., 27-21n-114w	400.0	210.0	[19]2&7	....	86.0	....	60.0	....	119.0	30.0	....
Phillips Petroleum Co.—Douglas, Converse Co., se4-ne4 34-33n-71w	75.0	NR	7	....	....	....	....	....	....	....	....
Ralston Processing Associates Inc.—Oregon Basin, Park Co., nw4 8-52n-100w	6.0	0.1	7	....	0.2	....	0.1	....	....	0.1	....
Propane-plus product brought into Basin plant to be fractionated	NA	NA	2	....	1.5	....	1.7	....	....	2.0	....
Sun Exploration & Production Co.—Grieve, Natrona Co., 22-32n-85w	10.0	11.7	[19]2	....	10.2	....	....	....	8.7	....	....
Lucky Ditch, Uinta Co.	15.0	15.3	3	....	....	....	....	....	16.2	....	....
Union Pacific Resources—*Brady, Sweetwater Co., 11-16n-101w	65.0	62.3	[19]2	....	19.0	....	27.3	....	....	25.1	....
Emigrant Trail, Uinta Co., 1-16n-113w	60.0	38.2	7	....	....	....	....	....	39.3	....	....
Manning, Converse Co., 15-39n-73w	3.0	0.4	3	....	....	....	....	....	0.7	....	....
Patrick Draw, Sweetwater Co., 25-19n-99w	25.0	18.1	7	....	13.7	3.1	5.4	....	....	5.3	....
Unocal—Worland, Washakie Co., 17-48n-92w	15.0	12.5	7	....	13.6	....	6.9	....	....	4.9	....
Western Gas Processors Ltd.—Amos Draw, Campbell Co., se¼ nw¼ 32-1n-75w	32.5	24.0	3		....	....	....	....	39.3	....	[11]1.6
Fairview, Richland Co., w2 sw4 sw4 24-25n-58e	5.0	4.0	3	....	7.5	....	....	9.4	....	....	[11]0.4
Hartzog Draw, Campbell Co., nw¼ ne¼ 11-45n-76w, 6th PM	6.0	8.8	3	....	....	....	....	....	23.0	....	[11]3.9
Hilight, Campbell Co., 26 sw14-45n-71w	60.0	16.0	3	....	20.0	....	11.1	....	....	8.0	[11]0.7
Newcastle, Weston Co., n2-nw4 9-42n-64w	5.0	3.0	3	....	8.8	....	....	10.0	....	....	[11]10.0
Oedekoven, Campbell Co. 45 55n-73w	12.0	3.0	3	....	1.6	....	....	2.3	....	....	[11]0.1
Spearhead, Converse Co., 13-79n-75w	21.0	6.8	2	....	....	....	....	....	12.8	....	....
Wexpro Co.—Church Buttes, Uinta Co., 1-16n-113w	3.5	2.2	[9]1	....	....	....	....	....	0.2	....	....
Woods Petroleum Corp.—*Powell, Converse Co., 38-39-40n 73&74w	40.0	36.0	3	....	....	....	....	53.5	....	....	....
Total	**2,864.0**	**2,282.7**		....	**279.7**	**10.7**	**195.0**	**77.9**	**1,701.9**	**1,020.8**	**1,782.0**

ABU DHABI

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Abu Dhabi Gas Industries Ltd.—*Asab NGL extract, Western Region	306.0	180.0	2-7	....	....	....	....	....	....	....	....
*Bu Hasa NGL extract, Western Region	396.0	234.0	2-7	....	....	....	....	....	....	....	....
Ruwais NGL	....	....	†	....	....	....	....	....	....	....	....
Abu Dhabi Gas Liquefaction CL—Zakum, Umm Shaif, Bunduo, Das Island	450.0	465.0	1-3-4 5-6	....	....	....	....	....	....	....	....
Abu Dhabi National Oil Co.—Habshan, Thamama C onshore area	450.0	340.0	[7]1	....	....	....	....	....	....	546.0	....
Total	**1,802.0**	**1,269.0**		....	....	....	....	....	....	**546.0**	....

†Fractionation. 22,000 tons day NGL capacity.

ALGERIA

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Sonatrach—Camel plant, Arzew	NR	170.0	4&7	....	....	....	....	218.6	....	....	....
Hassi R'Mel, Laghouat, Module 0	NR	1,578.0	NR	....	....	....	....	....	....	....	[11]2,309.0
Hassi R'Mel, Laghouat, Module 1	NR	2,085.2	6	....	....	....	....	....	....	....	[11]3,140.2
Skikda	NR	435.0	4&7	....	....	....	....	414.2	....	....	....
Total	**5,335.2**	**4,268.2**		....	....	....	....	**632.8**	....	....	**5,449.2**

Company, plant, location	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
ARGENTINA											
Cogasco SA—*Loma de la Lata, Neuquén	211.8	218.9	[23]5-7	....	50.3	....	36.4	....	....	79.2	....
Gas del Estado—*Cañadón Alfa, Tierra del Fuego	52.9	74.6	[13]1-3	....	....	....	....	....	....	14.6	....
*Cañadón Piedras, Tierra del Fuego	52.9	45.2	[13]1-3	....	....	....	....	....	....	7.3	....
*Cañadón Seco, Caleta Olivia, Santa Cruz	17.6	17.6	[13]1-[16]2	....	2.8	....	4.3	....	....	4.9	....
*Caimancito, Ledesma, Jujuy	35.3	53.0	[13]1-[16]2	....	6.0	....	7.5	....	....	6.7	....
*Centenario, Neuquén	17.6	17.6	[13]1-[16]2-4	....	4.2	....	4.8	....	....	7.2	....
Chimen Aike, Rio Gallegos, Santa Cruz	28.2	28.2	[35]1-3	....	....	....	....	....	....	160.1	....
El Huemul, Pico Truncado, Santa Cruz	97.1	28.2	[35]1-4	....	....	....	....	....	....	....	....
*El Medanito, Colonia Catriel, Neuquen	45.9	21.2	[35]1-3-4	....	....	....	....	....	....	7.8	....
*General Cerri, Buenos Aires	635.6	688.5	4-[23]5-7	694.9	343.5	....	214.0	....	....	100.4	....
Plaza Huincul, Cutral, Neuquén	17.6	14.1	4-[31]5	....	....	....	....	....	....	....	....
*Rio Neuquén, Neuquén	105.9	97.4	4-[31]5	....	....	....	....	....	....	37.1	....
Sierra Barrosa, Neuquén	26.4	17.6	4-[31]5	....	....	....	....	....	....	....	....
Total	**1,344.8**	**1,322.1**		**694.9**	**406.8**	....	**267.0**	....	....	**425.3**	....
AUSTRALIA											
Esso/BHP—											
Gippsland No. 1, Longford, Victoria	370.0	170.0	[19]2	93.0	147.0	....	83.0	....	....	182.0	....
Gippsland No. 2, Longford, Victoria	367.0	170.0	7	93.0	147.0	....	83.0	....	....	182.0	....
Gippsland No. 3, Longford, Victoria	370.0	170.0	7	93.0	147.0	....	83.0	....	....	182.0	....
Santos Ltd.—*Moomba, Cooper Basin	666.0	482.0	[13-14]1 [23]5-7	....	....	....	....	738.0	....	516.0	....
Woodside Offshore Petroleum PL—Withnell Bay, Burrup Peninsula, Karratha, n of w Australia	800.0	350.0	5-6	....	....	....	....	....	....	....	[11]850.0
Total	**2,573.0**	**1,342.0**		**279.0**	**441.0**	....	**249.0**	**738.0**	....	**1,062.0**	**850.0**
AUSTRIA											
OeMV AG—Aderklaa, Lower Austria	17.5	NR	[20]7	....	....	....	....	....	....	....	[5]10.7
Piberbach, Upper Austria	2.2	0.4	...	....	....	....	....	....	....	....	....
Total	**19.7**	**14.4**		....	....	....	....	....	....	....	**10.7**
BAHRAIN											
Bahrain National Gas Co.—Jebel Al-Dukhan	**168.0**	**155.0**	[19]2	....	**115.0**	....	**100.0**	....	....	**152.0**	....
BANGLADESH											
Bakhrabad Gas Systems Ltd.—											
*Muradnagar Upazilla-1, Comilla District	60.0	58.0	[35]1	....	....	....	....	....	....	....	....
*Muradnagar Upazilla-2, Comilla District	180.0	120.0	[31-32] 5	....	....	....	....	....	....	....	[11]8.2
Total	**240.0**	**178.0**		....	....	....	....	....	....	....	**8.2**
BOLIVIA											
Yacimientos Petroleos Fiscales Bolivanos—											
Colpa plant, Andres Ibanez Province, Santa Cruz	192.0	18.0	[13]1	....	....	....	....	7.8	....	5.7	[11]11.0
*Rio Grande plant, Cordillera Province, Santa Cruz	282.0	159.3	[13]1	....	1.4	2.5	....	153.9	....	55.8	[11]125.9
Total	**474.0**	**177.3**		....	**1.4**	**2.5**	....	**161.7**	....	**61.5**	**136.9**
BRAZIL											
Petrobrás—											
Asfor, Ceará	12.0	8.1	[47]2	....	....	....	....	20.3	....	4.0	....
Atalata, Sergipe	70.0	88.0	[47]2	....	....	....	....	146.4	....	47.3	....
Cabiúnas, Rio de Janeiro	19.5	16.6	[47]2	....	....	....	....	41.5	....	4.8	....
Cabiúnas, Rio de Janeiro	....	....	†8	....	....	....	....	18.3	....	21.4	....
Candeias, Bahia	70.0	84.7	[47]2	....	....	....	....	....	146.4	....	....
Catu, Agua Grande, Bahia	50.0	64.0	[47]2	....	....	....	....	....	93.0	....	[6]2.1
Guamaré, Rio Grande do Norte	70.6	45.0	[47]2	....	....	....	....	163.8	....	25.6	....
Lagoa Parda, Espírito Santo	5.7	5.3	3	....	....	....	....	6.6	....	2.6	....
Rio de Janeiro I	70.0	58.0	[47]2	....	....	....	....	130.0	....	21.7	[11]8.5
Rio de Janeiro II	70.0	45.0	7	6.1	....	....	....	92.0	....	15.1	[11]38.8
Total	**437.8**	**414.7**		**6.1**	....	....	....	**618.9**	**239.4**	**142.5**	**49.4**

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†396,000 g/d condensate capacity, 77,000 g/d condensate throughput.

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
BRUNEI											
Brunei Shell Petroleum Co. Sdn. Bhd.—*Seria	82.0	73.0	1	....	....	....	....	....	....	....	
Brunei LNG Sendirian Berhad—Lumut	950.0	772.0	6	....	7.7	....	....	....	54.4	242.0	....
Total	**1,032.0**	**845.0**		....	**7.7**	....	....	....	**54.4**	**242.0**	....

Canada

Alberta

Company, plant, location	Gas capacity	Gas throughput	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Alberta Natural Gas CL—*Cochrane, ne¼ 16-26-4 5w5m	1,300.0	1,300.0	6-7	1,920.0	....	....	....	....	710.0	....	....
Altana Exploration Co.—											
Caroline, 12-36-34-6-w5m	13.0	5.0	[19]2	....	....	....	....	....	8.9	....	....
Monitor, 10-3-35-4-w4m	9.0	3.5	4	....	....	....	....	....	....	....	....

Company, plant, location	MMcfd Gas capacity	Gas through-put	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Niton, 10-16-55-13-w5m	5.0	1.0	3	....	....	....	....	....	0.8	1.6	....
Saddle Lake, 16-26-57-13-w4m	5.0	1.1	4	....	....	....	....	....	....	....	....
Altex Resources Ltd.—											
Delburne, LSD 10-8-37-23 w4m	18.0	5.8	3-4	....	....	....	....	....	5.1	....	....
Penhold, LSD 10-30-36-27 w4m	6.5	4.6	3-4	....	....	....	....	....	4.0	....	....
Amoco Canada Petroleum CL—											
*Ante Creek-1, nw 18-65-23 w5m	10.0	5.0	3-4 [23]5	....	....	....	....	....	3.8	....	....
Ante Creek 4-13, LSD 4 13-65-24 w5m	3.0	1.0	[8]5	....	....	....	....	....	....	0.2	....
Ante Creek Dunvegan-3, LSD 10 4-66-23 w4m	10.0	3.4	3-4	....	....	....	....	....	3.2	....	....
Bigoray, 6-28-51-8 w5m	13.0	6.0	[21]1-3	....	....	....	....	....	....	1.1	....
*Bigoray 13-9, 13-9-52-8 w5m	5.0	2.0	3-4	....	....	....	....	....	6.4	....	[11]1.9
Bigstone D-3, sw¼ 10-61-22 w5m	49.0	40.0	[33]1-3	....	....	....	....	....	....	....	[12]78.2
Bigstone Dunvegan, se 10-61-22 w5m	18.0	17.0	3	....	....	....	....	....	31.7	....	....
Cache, 1-32-59-13 w4m	15.0	14.4	[13]1-4-	....	....	....	....	....	....	....	....
*D-1, East Crossfield, n¼ 14-28-1 w5m	110.0	74.0	[21]1 3-4	....	....	....	....	....	....	2.6	....
East Crossfield, ne¼ 14-28-1 w5m	35.0	29.0	3-4	....	....	....	....	....	13.2	....	....
Fir, ne¼ 32-58-21 w5m	47.5	24.0	[13]1	....	....	....	....	....	....	....	[11]7.7
Frenman, 11-21-64-9 w4m	12.5	4.0	[13]1-4	....	....	....	....	....	....	....	....
Granada, Pembina, LSD 2 18-52-11 w5m	30.0	21.0	3-4	....	....	....	....	....	20.5	....	....
Hylo, 12-65-15 w4m	3.3	1.0	[13]1-4	....	....	....	....	....	....	....	....
Josephine, ne¼ 1-83-10 w6m	50.0	12.0	3	....	....	....	5.8	....	....	....	....
Kirby, nw 25-73-5 w4m	45.0	18.0	[13]1-4	....	....	....	....	....	....	....	....
Lanaway, 13-5-36-4 w5m	15.0	3.6	[13]1-4	....	3.7	....	....	....	....	....	....
Leismer, 21 77-8 w5m	27.0	25.0	[13]1-4	....	....	....	....	....	....	....	....
Lobstick, sw¼ 17-50-7 w5m	35.0	24.0	3-4	....	....	....	....	....	....	8.5	....
Markerville, 10-6-36-2 w5m	15.0	3.0	[13]1	....	....	....	....	....	6.2	....	....
Marten Hills, 18-76-25 w4m	133.0	20.0	[13]1	....	....	....	....	....	....	....	....
*Nipisi, 4 11-80-8 w5m	25.0	30.0	4-[23]5 [21]1 4-[23]5	....	....	....	....	....	106.0	....	[11]4.6
Pembalta 1, ne¼ 25-48-7 w5m	8.0	6.0	3-4	....	....	....	....	....	4.8	....	....
Pembalta 2, e½ 15-47-7 w5m	16.0	13.0	3-4	....	....	....	....	....	7.6	....	....
Pembalta 7, sw¼ 34-47-9 w5m	14.0	8.0	3-4	....	....	....	....	....	8.7	....	....
Pembalta 8, sw¼ 5-49-9 w5m	11.0	4.0	3-4	....	....	....	....	....	3.2	....	....
*Ricinus, 11-30-35-8 w5m	115.0	97.0	4-7	....	....	....	....	....	21.2	....	....
St. Albert, 14 36-53-26 w4m	2.0	0.5	[3]1-3-4	....	....	....	....	....	4.1	....	....
Sedalia, 5-26-30-4 w4m	8.5	2.0	3-4	....	....	....	....	....	....	<0.1	....
South Wapiti, ne 36-67 9 w6m	300.0	122.0	[32]5	....	....	....	....	....	....	30.6	....
Three Hills Creek, nw½ 13-35-26 w4m	12.0	3.0	3-4	....	....	....	....	....	6.6	....	....
Waskahigan, ne7-64-23 w5m	16.3	12.0	[32]5	....	....	....	....	....	....	2.7	....
*West Whitecourt, 8-17-60-15 w5m	421.6	202.0	[4]1-3-4	....	....	....	....	....	129.5	....	[12]1.2
Worsley, 7-22-87-7 w6m	45.0	0.3	[19]5	....	....	....	....	....	....	3.6	....
Anderson Exploration Ltd.—											
Belloy, 16-3-78-1 w6m	9.0	8.5	4-[32]5	....	....	....	....	....	....	1.0	....
Bruce, 10-1-48-15 w4m	3.0	2.0	4	....	....	....	....	....	....	....	....
Buff Coulee, 11-12-47-7 w4m	6.6	6.6	4	....	....	....	....	....	....	....	....
Dunvegan, 15-3-81-4 w6m	240.0	125.0	3-4-7	....	....	....	....	....	85.0	38.0	....
Hines, LSD 6-35-85-3 w6m	8.0	6.0	4-[32]5	....	....	....	....	....	....	....	....
Dixonville, 8-14-85-25 w4m	4.0	2.0	4	....	....	....	....	....	....	....	....
Kitscoty, 10-17-51-3	2.0	0.2	4	....	....	....	....	....	....	....	....
Lloydminster, 7-11-51-1 w4m	2.0	1.0	4.	....	....	....	....	....	....	....	....
Manyberries, 10-1-5-5 w4m	1.5	1.2	4	....	....	....	....	....	....	....	....
Mirage, 10-2-79-8 w4m	1.5	0.2	3-4	....	....	....	....	....	....	0.2	....
Ausquacan Energy Ltd.—Bantry, LSD 4 33-17-12 w4m	12.4	5.5	2	<0.1	0.3	....	0.8	....	....	2.7	....
Bumper Development Corp. Ltd.—Bumper Crystal, Wetaskiwin, 16-36-45-4 w5m	4.0	1.5	3	....	....	....	....	....	3.0	....	....
Bumper Rose Creek, Wetaskiwin, 8-13-45-7 w5m	5.0	4.0	4-[13]5	....	....	....	....	....	....	....	....
Canadian Hunter Exploration Ltd.—											
Basset Station 1, ne¼ 29-104-2 w6m	7.0	3.6	[32]5	....	....	....	....	....	....	0.1	....
Basset Lake South, ne¼ 29-106-5 w6m	4.0	2.7	3	....	....	....	....	....	....	0.1	....
Elmworth Deep Cut, se¼ 8-70-11 w6m	275.0	155.0	7	....	....	....	....	233.0	....	....	....
Elmworth Shallow Cut, se¼ 8-70-11 w6m	300.0	190.0	[31]5	....	....	....	....	....	....	21.5	....
Haig River, nw¼ 33-104-5 w6m	5.4	2.3	3	....	....	....	....	....	....	0.1	....
Karr, nw¼ 10-65-2 w6m	50.0	31.0	3	....	8.2	....	9.5	....	....	26.2	....
South Gold Creek, nw¼ 15-66-5 w6m	15.0	1.9	[35]1	....	....	....	....	....	....	0.6	....
Canadian Occidental Petroleum Ltd.—											
Carrot Creek, 2-26-52 12 w5m	14.0	9.0	3	....	....	....	....	§15.2	....	....	....
Keystone, 5 35-46-4 w5m	10.0	4.0	2	....	1.8	....	1.8	....	....	1.9	....
Mazeppa, se¼ 35-19-28 w4m	42.4	17.7	[33]2	....	....	....	....	....	....	....	[11]17.4
Paddle River, LSD 13, 6-57n-8 w5m	...	...	[7]1-7	10.9	16.9	....	9.5	....	....	7.3	....
Petrogas Processing, Crossfield, s½ 2-26-29 w4m	210.0	74.0	[7]1	....	34.3	....	24.3	....	....	44.9	....
Canterra Energy Ltd.—											
*Cessford, Special Area 3, LSD 4-6-24-10 w4m	12.0	5.0	4-[31]5	....	....	....	....	....	....	....	....
Consort (Provost), 7-34-34-6 w4m	10.0	3.5	3-4- [31]5	....	....	....	....	....	....	....	[11]0.5
Entice, se 24-28-24 w4m	6.0	5.0	4-[31]5	....	....	....	....	....	....	....	[11]0.1
Flat Lake, 13-12-66-20	30.0	5.5	4-[31]5	....	....	....	....	....	....	....	....
Ghost Pine, 10-4-32-23 w4m	2.4	1.1	3-4	....	....	....	....	....	....	....	[11]0.1
Judy Creek, 8-24-63 10 w5m	4.5	1.9	3-4	....	....	....	....	....	0.4	....	....
Hussar, 13-36-24-21 w4m	84.0	21.2	[1]2-4	....	14.8	....	13.4	....	....	....	[11]7.5
Nipisi, 12-28-80-9 w5m	0.1	...	3	....	....	....	....	....	1.3	....	
Nordegg River (Brazeau R), w½ 10-44-12 w5m	66.7	16.3	[7]1-[31]5	....	....	....	....	....	....	....	[11]7.7
North Oyen, 11-17-29 w4m	4.0	1.0	4-[31]5	....	....	....	....	....	....	....	....
Okotoks, MD 31, Foothills, sw¼ 27-20-29 w4m	34.8	29.5	[21]1-[31]5	....	....	....	....	....	....	....	[11]3.7
Rainbow, 10-10-109-8 w6m	104.0	93.7	[7]1	....	....	....	....	....	668.0	....	....
Ram River, 2-37-10 w5m	630.0	332.0	3-4 [7]1	....	....	....	....	....	....	....	[11]34.1

Company, plant, location	MMcfd Gas capacity	Gas throughput	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Sinclair, 2-14-72-12 w6m	10.0	5.5	3	....	....	....	....	....	5.0	....	....
South Mitsue, 2-2-69-3 w5m	0.1	...	3	....	....	....	....	....	0.3	....	....
Veteran (Provost), 15-29-34-8 w4m	7.0	3.1	3-4-[31]5	....	....	....	....	....	....	....	[11]1.3
Wayne Rosedale, 12-4-28-20 w4m	15.0	7.2	3-4 [31]5	....	....	....	....	....	1.6	....	[11]1.0
Wimborne, 16-5-35-26 w4m	3.8	1.3	3-4	....	....	....	....	....	....	....	[11]0.1
Chevron Canada Resources—											
*Bigoray, 10-7-51-9 w5m	3.0	NR	3-4	....	....	....	....	....	....	....	....
*Brazeau, 16-35-48-12 w5m	25.0	13.6	3-4	....	....	....	....	28.4	68.1	....	....
Ferrybank, 14-11-45-27 w4m	5.2	4.7	3-4	....	....	....	....	3.4	....	....	....
Joffre, 14-36-38-27 w4m	9.0	1.1	3-4	....	....	....	....	1.0	....	....	....
*Kaybob South No. 3, 15-59-18 w5m	445.0	370.8	[19]2-7	....	....	....	....	99.4	309.1	285.1	....
*Mitsue, 11 30-72-4 w5m	30.0	NR	[19]2-4	....	....	....	....	....	....	....	....
North Gilby, 1-24-41-3 w5m	23.0	11.6	3&[32]5	....	....	....	....	10.9	....	....	....
Pouce Coupe, 6-30-79-11 w6m	11.0	10.0	3	....	....	....	....	8.4	....	....	....
Princess, 12-12-20-12 w4m	10.0	2.7	[32]5	....	....	....	....	....	....	0.4	....
Sylvan Lake, 1-21-38-2 w5m	31.5	18.0	[19]2	....	15.4	....	11.9	....	....	8.7	....
*West Pembina, 11-22-49-12 w5m	29.7	26.2	3-4	....	....	....	....	30.5	....	67.2	....
Chieftain Development CL—											
Chisholm, 11-2-69 1 w5m	4.0	4.0	[35]1	....	....	....	....	....	....	....	....
Craigend, 9-25-64 14 w4m	9.0	9.0	[35]1	....	....	....	....	....	....	....	....
Hythe-Brainard, 14-18-74 12 w6m	130.0	100.0	[33]5-6	....	....	....	....	....	....	0.2	....
Island Lake, 10-21-67 24 w4m	4.0	4.0	[35]1	....	....	....	....	....	....	....	....
Keg River, 7-12-103 24 w5m	21.0	20.0	[35]1	....	....	....	....	....	....	....	....
Tweedie, 11-5-68 12 w4m	11.0	11.0	[35]1	....	....	....	....	....	....	....	....
Cooperative Energy Development Corp.—											
Blackie, 06-15-20-27 w4m	4.0	1.0	[13-26]2-4	....	....	....	....	....	1.0	....	....
Carrot Creek, LSD 10-16-53-13 w5m	8.0	6.0	[13-26]2-4	....	....	....	....	....	8.0	....	....
Edson 1-13, LSD 1-13-54-19 w5m	10.0	6.0	[13-26]2-4	....	....	....	....	....	9.0	....	....
Edson North, LSD 16-15-53-18 w5m	8.0	4.5	[13-26]2-4	....	....	....	....	....	5.6	....	....
Edson South, 10-30-52-17 w5m	1.5	1.0	[13-26]2-4	....	....	....	....	....	1.5	....	....
Losegun 4-15, LSD 4-15-65 20 w5m	6.0	4.0	[13]1	....	....	....	....	....	....	....	....
Losegun 10-23, LSD 10-23-65-20 w5m	10.0	8.0	[13]1	....	....	....	....	....	....	....	....
Losegun 10-27, LSD 10-27-65-20 w5m	6.0	4.0	[13]1	....	....	....	....	....	....	....	....
Medicine River, LSD 10-14-39-3 w5m	6.0	6.0	[13-26]2-4	....	....	....	....	....	7.5	....	....
DeKalb Petroleum Corp.—											
Blueberry Mountain, 11-16-82-7 w6m	10.0	5.0	5	....	....	....	....	....	....	1.5	....
Bingley, 2-36-40-7 w5m	2.6	2.6	6	....	....	....	....	....	4.0	....	....
Garrington, 13-5-34-3 w5m	12.0	5.0	7	....	....	....	....	....	6.5	....	....
Leafland, 15-31-39-5 w5m	23.5	10.0	7	....	....	....	....	....	13.0	13.0	....
Nevis, 12-7-41-22 w4m	27.0	10.0	[11]1	....	....	....	....	....	....	....	....
Dome Petroleum Ltd.—Amisk, 4-22-41-8-w4m	10.3	3.4	3-4-5	....	....	....	....	....	....	0.1	....
Athabasca East, 9-23-66-22 w4m	9.0	3.2	4	....	....	....	....	....	....	....	....
Athabaska North, 5-18-67-22 w4m	6.0	2.2	4	....	....	....	....	....	....	....	....
Atlee-Buffalo, 12-21-20-8 w4m	4.0	1.0	4	....	....	....	....	....	....	....	....
Arrowwood North, 4-15-21-25 w4m	7.9	4.0	4	....	....	....	....	....	....	....	....
Arrowwood South, Hussar, 1-7-20-25 w4m	24.9	5.2	4	....	....	....	....	....	....	....	....
Bolloque, 16-23-64-26 w4m	10.0	2.7	4	....	....	....	....	....	....	....	....
Bouvier, 15-29-70-24 w4m	5.2	0.7	4	....	....	....	....	....	....	....	....
Braeburn, 16-19-77-10 w6m	5.6	0.1	4	....	....	....	....	....	....	....	....
Brazeau River, 1-46-14 w5m	218.0	79.0	1-3-4	....	....	....	....	33.3	....	....	....
Brownfield, se¼-2-39-12 w4m	19.9	14.6	4-5	....	....	....	....	....	....	1.6	....
Caroline North, 1-11-35-6 w5m	52.2	27.5	3-4	....	....	....	....	....	30.2	25.1	....
Caroline South, 3-20-34-4 w5m	53.6	29.7	3&5	....	18.1	....	17.6	....	....	27.8	....
*Castor East, 4-3-38-13 w4m	19.9	7.3	4-5	....	....	....	....	....	....	0.7	....
Cessford, 2-8-24-12 w4m	125.0	26.6	3-4	....	....	....	....	....	....	3.1	....
Cherhill, 4-24-56-5 w5m	4.5	2.8	3	....	....	....	....	....	1.9	....	....
Chinchaga, 1-24-96-5 w6m	89.0	46.2	3-4	....	....	....	....	....	46.8	73.0	....
Choice, 13-17-40-9 w4m	9.9	1.7	4-5	....	....	....	....	....	....	0.1	....
Consort, 8-19-36-5 w4m	70.6	21.6	4	....	....	....	....	....	....	8.0	....
Craigend, 16-1-64-13 w4m	5.0	1.5	4	....	....	....	....	....	....	....	....
Cutbank, 7-16-62-8 w6m	70.0	15.8	3-4	....	....	....	....	....	6.6	....	....
Duvernay, 11-11-55-12 w4m	14.6	2.0	4	....	....	....	....	....	....	....	....
Edmonton Ethane, sw¼-4-52-25 w4m	315.0	207.1	7	344.8	....	....	....	....	283.3	....	....
Edwand, 7-12-62-17 w4m	2.5	0.5	4	....	....	....	....	....	....	....	....
Edson, 3&4 11-53-18 w5m	372.0	124.7	1-3-4	....	....	....	....	....	....	38.0	....
Elk River, 4-6-47-12 w5m	7.0	1.8	3	....	....	....	....	....	....	0.6	....
Empress Ethane 1, sw¼ 12-20-1 w4m	1,500.0	1,304.0	7	716.8	....	....	....	....	541.1	....	....
Empress Ethane 2, sw¼ 12-20-1 w4m	2,000.0	592.0	7	451.9	....	....	....	....	292.7	....	....
Enchant, 11-9-14-16 w4m	7.0	4.0	4	....	....	....	....	....	....	....	....
Flat Lake, 11-17-67-18 w4m	6.5	0.6	4	....	....	....	....	....	....	....	....
Garrington, 11-17-34-3 w5m	19.9	7.9	3-4 5&7	....	....	....	....	22.1	2.5	....	....
Gilby North, 9-12-41-4 w5m	4.6	1.6	3-4	....	....	....	....	....	....	0.7	....
Gilby South, 8-26-40-3 w5m	9.0	3.3	5	....	....	....	....	....	....	1.6	....
Goodfare, sw 19-72-11 w6m	69.5	43.4	3	....	....	....	....	....	12.7	....	....
Haight Mundare, 6-8-53-16 w4m	7.0	2.6	4	....	....	....	....	....	....	....	....
Hilda, 16-22-17-2 w4m	6.0	2.0	4	....	....	....	....	....	....	....	....
Hollow, 10-22-61-20 w4m	10.0	2.3	4	....	....	....	....	....	....	....	....
Hotchkiss MD, 11-29-94-25 w5m	191.1	9.6	4	....	....	....	....	....	....	....	....
Hotchkiss North, 2-35-94-2 w6m	20.6	8.9	4	....	....	....	....	....	....	....	....
Hotchkiss South, 9-34-93-01 w6m	22.1	5.0	4	....	....	....	....	....	....	....	....
Inland, 4-25-51-15 w4m	7.4	1.6	3-4	....	....	....	....	....	....	<0.1	....
Inland South, 15-31-50-14 w4m	9.0	3.9	4	....	....	....	....	....	....	....	....
Jenner, 10-34-19-9 w4m	13.9	4.9	4	....	....	....	....	....	....	....	....
Jenner-Musketeer, 10-34-19-09 w4m	13.9	3.7	4	....	....	....	....	....	....	....	....
*Kaybob South 1, 1-12-62-20 w5m	226.0	122.4	1-3-4	....	77.7	....	59.7	....	....	120.6	....
*Kaybob South 2, 3&4 12-62-20 w5m	170.0	108.7	1-3-4	....	....	....	....	....	125.8	143.6	....
Keystone, 6-15-48-3 w5m	7.4	3.9	3-4	....	....	....	....	....	5.3	....	....
Kirby Lake, 12-8-74-5 w5m	44.8	13.5	4	....	....	....	....	....	....	....	....
Lavoy, 11-12-52-14 w4m	15.9	13.2	4	....	....	....	....	....	....	....	....
Lone Pine Creek, 6-23-30-28 w4m	74.0	22.4	3-4	....	....	....	....	....	....	19.6	....
Mannville, 3-27-50-9 w4m	33.9	6.5	4	....	....	....	....	....	....	....	....
Medicine Hat, 2-27-15-4 w4m	12.0	10.4	4	....	....	....	....	....	....	....	....
Medicine Hat North, 1-7-16-2 w4m	4.5	3.0	1&4	....	....	....	....	....	....	....	....
Medicine River, 6-16-38-4 w5m	8.0	3.7	3	....	....	....	....	....	2.9	....	....

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Meanook, 6-10-63-22 w4m	5.2	4.0	4	....	....	....	....	....	....	....	....
Monitor, 2-3-35-5 w4m	6.5	0.8	1&4	....	....	....	....	....	....	....	....
Patricia, 13-5-21-12 w4m	7.9	3.1	4	....	....	....	....	....	....	....	....
Prosperity, 11-28-67-19 w4m	6.0	4.5	1&4	....	....	....	....	....	....	....	....
Provost, ne¼-19-36-5 w4m	80.0	50.0	5	....	....	....	....	....	....	3.3	....
Provost East, 3-30-37-2 w4m	9.5	5.2	4-5	....	....	....	....	....	....	0.7	....
Ranfurly, 14-32-50 12 w4m	15.9	3.4	4	....	....	....	....	....	....	....	....
Steele, 10-19-77-24 w4m	9.0	2.2	5	....	....	....	....	....	....	....	....
Sturgeon Lake South, se 2-69-22 w5m	20.0	13.0	3-4	....	....	....	....	....	26.1	....	....
Sundance, 6-25-54-21 w5m	15.5	14.9	3-4	....	....	....	....	....	....	10.5	....
Sylvan Lake, 10-12-38-3 w5m	4.0	1.9	4	....	....	....	....	....	1.6	....	....
Sylvan Lake, 14-32-37-3 w5m	64.7	24.5	3	....	19.9	....	10.3	....	....	9.3	....
Tangent, 16-20-80-24 w5m	7.5	1.1	3	....	....	....	....	....	....	....	....
Tower North, 6-14-76-16 w4m	7.0	7.3	4	....	....	....	....	....	....	....	....
Travers, 16-13-14-18 w4m	15.0	6.7	3-4	....	....	....	....	....	....	0.1	....
Twining, sw 31-32-24 w4m	8.3	6.0	3-4	....	....	....	....	....	....	5.0	....
Valhalla, 1-29-75-9 w6m	31.4	14.5	3	....	....	....	....	....	....	2.1	....
Verger, 6-25-23-16 w4m	2.0	0.1	3	....	....	....	....	....	....	....	....
Vulcan, se¼-24-15-22 w4m	55.2	39.6	3-4	....	....	....	....	....	7.0	....	....
Wandering River, 9-30-72-14 w4m	11.9	1.9	4	....	....	....	....	....	....	....	....
Warwick, 10-18-53-14 w4m	8.4	2.6	4	....	....	....	....	....	....	....	....
West Fox Creek, 13-22-60-19 w5m	15.7	4.5	3-4	....	....	....	....	....	....	....	....
West Paddle River, 11-10-56-11 w5m	17.7	7.8	3	....	....	....	....	6.2	....	1.4	....
Whitelaw, 13-20-81-1 w6m	10.0	2.1	4	....	....	....	....	....	....	....	....
Wildunn, 7-9-12 w4m	10.0	4.6	3	....	....	....	....	....	....	0.3	....
*Willesden Green, 27-42-8 w5m	40.0	27.0	3-7	....	....	....	....	....	30.4	....	....
Zama, nw 12-116-6 w6m	25.2	9.7	3	....	....	....	....	....	13.4	4.7	....
Enron Oil Canada Ltd.—											
Highvale, 10-4-51-4 w5m	8.0	4.9	3	....	....	....	....	2.3	....	....	[11]0.5
Thunder, 9-20-59-6 w5m	7.0	6.7	3	....	....	....	....	2.8	....	....	....
Esso Resources Canada Ltd.—Big Bend, 13-36-66-27 w4m	35.0	12.0	[7-13]1-3	....	....	....	....	....	....	....	....
Boundary Lake South, Floral, 1-14-85-13 w6m	17.0	3.1	4	....	....	....	....	....	....	0.8	....
Castor, 4-3-38-13 w4m	1.5	0.9	[13]1-6	....	....	....	....	....	3.8	....	....
Comet Galaxy, Rainbow Lake, 12-23-110-7 w6m	8.0	5.8	3	....	....	....	....	....	....	....	....
Countess, 8-36-20-16 w4m	4.5	0.7	[13]1	....	....	....	....	....	....	....	....
*Devon—1 and 2, 34-50-26 w4m	....	....	†	....	(138.7)	....	(89.8)	....	....	(69.4)	....
Euerdell, Ferrier 14-20-38-7 w5m	10.0	3.8	3-4	....	3.5	....	2.2	....	....	1.1	....
Golden Spike, 16-22-51-27 w4m	126.0	126.0	4	....	20.3	....	13.6	....	....	10.1	....
Irish, 16-36-54-6 w4m	15.0	5.0	[11]1	....	....	....	....	....	....	....	....
Joffre D2, Lacombe, ne¼ 17-39-26 w4m	7.5	3.0	3-4	....	2.8	....	1.7	....	....	0.5	....
Judy Creek, 10-25-64-11 w5m	265.0	153.6	1-2-3 4-5&7	....	....	....	....	....	723.4	....	....
Leduc, Devon, 34-50-26 w4m	35.0	29.2	3	....	17.2	....	18.2	....	....	9.1	....
Medicine Hat-Roseglen, 4-1-16-3 w4m	20.0	7.8	[11]1	....	....	....	....	....	....	....	....
Niton, LSD 14-18-54-12 w5m	50.0	30.7	3	....	3.8	....	3.8	....	....	[illegible]	....
Quirk Creek, s½ 4-21-4 w5m	90.0	33.3	2	....	14.4	....	10.7	....	....	13.8	....
Redwater, LSD 8 29-57-21 w4m	22.1	10.2	2	....	23.0	....	18.1	....	....	11.1	....
Wapiti, 4-8-69-8 w6m	125.0	78.5	3-4	....	....	....	....	....	....	9.6	....
Wapiti Deep Cut, 4-8-69-8 w6m	320.0	124.0	3-4 [21]5-6-7	....	....	....	....	217.0	....	....	....
Gulf Canada Corp.—											
Baptiste, LSD 5-28-67-22 w5m	10.4	3.4	[15]5	....	....	....	....	....	....	....	....
Baptiste Island Lake	5.2	1.0	[21]1-4	....	....	....	....	....	....	....	....
Blood Magrath, 7-8-6-22 w4m	11.5	3.1	3	....	....	....	....	....	0.3	....	....
Buffalo Lake North, LSD 11-24-41-21 w4m	7.1	1.1	3	....	....	....	....	....	....	0.1	....
Hanna, LSD 2-36-31-14 w4m	3.0	1.0	3-4	....	....	....	....	....	....	0.2	....
Hanlan-Robb, ne¼ 2-49-20 w5m	304.0	148.0	[7]2	....	....	....	....	....	....	3.7	....
Island Lake, 1-18-68-23 w4m	5.2	1.0	[21]1-4	....	....	....	....	....	....	....	....
Morrin-Ghost Pine, LSD 1, 8-11-31-21 w4m	109.4	42.0	3	....	....	....	....	....	....	0.8	....
Nevis, ne¼ 9-33-38-22 w4m	125.0	60.0	[19-21]2-4	....	69.0	....	47.0	....	....	35.0	....
Rimbey, LSD s½ 5-44-1 w5m	421.0	233.0	[21]2	....	239.0	....	139.0	....	....	181.0	....
Strachan, LSD 1T-35-37-9 w5m	275.0	137.0	7	....	....	....	....	85.0	....	109.0	....
Swalwell, LSD 6-33-29-24 w5m	4.0	1.3	5	....	....	....	....	....	....	....	....
West Drumheller, 12-1-30-21 w4m	3.4	1.4	[21]1	....	....	....	....	....	....	0.8	....
Home Oil CL—Bashaw, 8-10-42-22 w4m	11.9	4.3	5	....	....	....	....	....	....	....	[11]0.1
Carstairs-Crossfield, 3-3-30-2 w5m	280.0	40.5	2	....	55.8	....	28.5	....	....	62.1	....
Cossack, 7-17-60-17 w4m	6.0	1.8	4	....	....	....	....	....	....	....	....
Leismer, 6, 7-77-7 w4m	35.0	26.7	4	....	....	....	....	....	....	....	....
Marten Hills South-1, 14-22-74-24 w4m	21.0	7.0	4	....	....	....	....	....	....	....	....
Marten Hills South-2, 14-29-74-25 w4m	8.0	0.8	4	....	....	....	....	....	....	....	....
Retlaw, 12-2-13-19 w4m	10.0	2.6	5	....	....	....	....	....	....	0.4	....
South Elkton, 2-3-31-4 w5m	4.4	1.8	2	....	....	....	....	....	....	0.1	....
Tieland, 5-14-67-2 w5m	10.0	2.8	4	....	....	....	....	....	....	....	....
ICG Resources Ltd..—											
Acheson, sw¼ 2-53-26 w4m	7.5	7.5	3	....	27.0	....	14.0	....	....	8.6	....
Chard, 16-1-79-5-w4m	5.3	5.3	4	....	....	....	....	....	....	....	....
Cowpor, 11-19-80-4w4m	12.0	7.0	4	....	....	....	....	....	....	....	....
Gilby, 10-10-041-03-w5m	12.0	6.0	[28]5	....	....	....	....	....	1.7	....	....
Hilda, 4-26-17 2 w4m	5.5	2.0	4	....	....	....	....	....	....	....	....
Leafland, 13-16-040-05 w4m	5.5	5.5	6	....	....	....	....	8.0	....	....	....
Many Islands, 4-16-14-1 w4m	28.0	20.0	4	....	....	....	....	....	....	....	....
Tweedie, se½ 19-68-12 w4m	15.0	7.5	4	....	....	....	....	....	....	....	....
Jordan Petroleum Ltd.—Three Hills, LSD 11-16-31-23 w4m	5.0	1.5	2	....	....	....	....	....	0.6	....	....
Kerr-McGee Corp.—											
Craigmyle, 13-5-32-17 w4m	6.2	6.2	[26]3	....	....	....	....	....	2.2	2.0	....
Elnora, 5-19-35-22 w4m	18.0	15.0	[4]3	....	....	....	....	....	4.2	....	....
Ferrybank, 3-31-44-27 w4m	8.5	8.5	[12]3	....	....	....	....	....	....	0.5	....
Rich, 16-22-35-21 w4m	3.0	2.0	[26]3	....	....	....	....	....	....	0.5	....
Mobil Oil Canada Ltd.—											
*Carson Creek, 4 23-61-12 w5m	70.0	61.0	[19]2-4	....	64.8	....	36.9	....	....	42.4	....
*Duhamel, 3 32-46-21 w4m	3.7	0.7	3-4	....	....	....	....	....	3.3	1.9	....
Harmattan, 27-31-4 w5m	504.0	249.0	[19]2-4	....	141.9	....	70.8	....	....	105.1	....

Company, plant, location	MMcfd Gas capacity	MMcfd Gas through-put	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Liege, 1-16-92-21 w4m	30.0	7.0	4	....	....	....	....	....	....	....	....
Lone Pine Creek South, 27-29-28 w4m	35.0	10.0	3-4	....	....	....	....	....	....	4.5	....
Teepee Creek, Grande Prairie, LSD 7-2-74-4 w6m	18.5	4.7	3	....	....	....	....	....	....	1.7	....
Three Hills, 4 33-31-23 w4m	30.0	11.0	3-4	....	....	....	....	....	9.6	3.5	....
Willesden Green, 8 29-40-6-5 w5m	2.0	1.3	3-4	....	....	....	....	....	1.9	....	....
Wimborne, 4 12-34-26 w4m	30.0	17.0	3-4	....	....	....	....	....	....	11.0	....
Wintering Hills, 16 7-24-16 w4m	6.0	1.1	3-4	....	....	....	....	....	....	0.1	....
Murphy Oil CL—Glendon, Sugden-Grand Rapids, 03-16-61-8 w4m	11.0	0.8	4	....	....	....	....	....	....	....	....
Princess No. 1, 14-23-19-10 w4m	7.5	4.0	[13]4	....	....	....	....	....	....	....	....
Princess No. 2, 08-16-20-10 w4m	7.5	4.0	[13]4	....	....	....	....	....	....	....	....
Norcen Energy Resources Ltd.—											
Bigoray, Parkland 31, 10-22-51-8 w5m	3.0	1.3	4	....	....	....	....	....	0.3	....	....
Boyer, 1-17-105 1 w6m	18.0	7.0	4-[8]5	....	....	....	....	....	....	0.3	....
Bruce, Beaver 9, 2-6-47-15 w4m	30.0	4.5	1&4	....	....	....	....	....	....	<0.1	....
Ferrier, Radial Lake, se¼ 2-34-40-9 w5m	20.6	8.9	2	....	3.3	....	1.2	....	....	3.5	....
Fort Saskatchewan, se¼ 3-55-22 w4m	35.0	32.0	7	....	....	....	....	....	62.0	....	....
Gilby, Lacombe, 10-8-41-1 w5m	2.6	1.0	2&4	....	....	....	....	0.4	....	....	....
Judy Creek, 12-19-64-1 w5m	2.0	1.4	[12]5	....	....	....	....	....	....	0.3	....
Kessler, 14-5-39-8 w4m	5.6	2.0	4	....	....	....	....	0.3	....	....	....
McLeod, 16-17-55 14 w5m	3.2	2.7	...	....	....	....	....	....	1.4	....	....
McLeod River, Dist. 14, 7-34-54-14 w5m	5.2	4.1	3	....	....	....	....	....	3.4	....	....
Minnehik-Buck Lake, 10-5-46-6 w5m	108.0	77.6	[5]1 [28]5-7	....	....	....	....	....	102.1	....	....
Netook-Olds, Mountain View 17, 16-21-33-1 w5m	1.9	1.2	1&4	....	....	....	....	....	....	15.5	....
Provost-Bodo, Provost 52, ne¼ 16-31-37-2 w4m	6.0	1.0	3-4	....	....	....	....	....	....	30.0	....
Spirit River, 8-34-77 6 w6m	4.0	3.5	3	....	....	....	....	....	5.6	....	....
St. Albert, Sturgeon Dist., se¼ 3-26-54-25 w4m	20.0	13.6	[19]2	....	5.4	....	3.7	....	....	3.5	....
North Canadian Oils Ltd.—											
Atlee Buffalo, 5-22-20-4 w4m	4.0	3.5	4	....	....	....	....	....	....	....	....
Bantry, 5-8-19-13 w4m	18.0	12.0	4	....	....	....	....	....	....	....	....
Beaverhill Lake, 4-17-52-18 w4m	3.0	2.5	1&4	....	....	....	....	....	....	....	....
Bellshill Lake, 7-21-42-12 w4m	4.0	3.5	1&4	....	....	....	....	....	....	....	....
Buffalo South, 4-22-20-5 w4m	4.0	3.5	4	....	....	....	....	....	....	....	....
Canard, 9-30-57-8 w4m	12.0	12.0	4	....	....	....	....	....	....	....	....
Conlac, Medicine Hat, 14-14-14-3 w4m	25.0	12.0	4	....	....	....	....	....	....	....	....
Corbett Creek, 13-26-61-8 w5m	12.0	0.5	3-4	....	....	....	....	....	....	....	....
Delia, 1-13-32-19 w4m	25.0	23.0	4	....	....	....	....	....	....	....	....
Dinant, Bruce, 1-26-45-19 w4m	20.0	20.0	4	....	....	....	....	....	....	....	....
Fenn Big Valley, 8-27-35-19 w4m	8.0	7.0	3-4	....	....	....	3.0	....	....	....	....
Garden-Plains, 5-15-33-13 w4m	10.0	3.5	1&4	....	....	....	....	....	....	....	....
Hilda, Medicine Hat, 9-34-18-2 w4m	7.0	3.5	4	....	....	....	....	....	....	....	....
Hilda Schuler, 13-9-17-1 w4m	5.0	3.4	4	....	....	....	....	....	....	....	....
Hilda West, 4-19-18-1 w4m	3.5	2.7	4	....	....	....	....	....	....	....	....
Jarrow, 8-15-45-11 w4m	4.0	3.5	4	....	....	....	....	....	....	....	....
Knopcik, 9-10-74-11 w6m	25.0	20.0	3-4	....	....	....	....	....	7.0	....	....
Minburn, 8-24-51-10 w4m	7.0	7.0	4	....	....	....	....	....	....	....	....
Morinville, 11-15-55-25 w4m	2.5	1.4	1&4	....	....	....	....	....	....	....	....
North Mannville, 13-16-53-10 w4m	7.0	6.0	4	....	....	....	....	....	....	....	....
North Plain Lake, 13-31-54-11 w4m	14.0	14.0	4	....	....	....	....	....	....	....	....
Schuler, 1-28-16-1 w4m	3.5	2.5	4	....	....	....	....	....	....	....	....
Sedgewick, 4-27-44-10 w4m	3.0	1.5	4	....	....	....	....	....	....	....	....
Simonette, 7-6-63-26 w5m	2.0	1.0	4	....	....	....	....	....	....	....	....
Sugden, 11-11-65-9 w4m	2.0	2.0	4	....	....	....	....	....	....	....	....
Vale, Medicine Hat, 15-19-14-3 w4m	30.0	15.0	4	....	....	....	....	....	....	....	....
Viking-Kinsella, 11-17-46-8 w4m	15.0	10.0	4	....	....	....	....	....	....	....	....
Warwick, 8-34-52-14 w4m	4.0	1.5	4	....	....	....	....	....	....	....	....
Westlock, 13-24-61-26 w4m	9.0	6.5	3-4	....	....	....	....	....	....	....	....
Willingdon, 11-20-55-15 w4m	18.0	10.0	4	....	....	....	....	....	....	....	....
NSM Resources Ltd.—											
Choice, 5 27-40-10 w4m	3.0	3.0	[3]2	....	....	....	....	....	....	<0.1	....
Redwater, Lamont, 15-16-56-20 w4m	1.0	0.1	3	....	....	....	....	....	....	<0.1	....
Palmer Ranch (1984) Ltd.—Pincher Creek, s½ 23-4-29 w4m	12.0	6.0	3-4	1.0	....	....	....	....	....	4.5	....
Paloma Petroleum Ltd.—											
Berry, 16-21-28-13 w4m	9.0	8.0	3-4	....	....	....	....	....	....	....	[11]0.1
Compeer, 4-31-33 1 w4m	8.0	2.2	4	....	....	....	....	....	....	....	....
Hotchkiss, LSD 7 13-94-3 w6m	6.0	2.5	4	....	....	....	....	....	....	....	....
Kinsella, 12-36-49 13 w4m	5.0	3.5	4	....	....	....	....	....	....	....	....
Lavory, 6-13-52-14 w4m	8.5	7.5	4	....	....	....	....	....	....	....	....
Viking, LSD 12 36-49-13 w4m	4.5	1.5	4	....	....	....	....	....	....	....	....
PanCanadian Petroleum Ltd.—Alderson West, 10-28-15-15 w4m	23.5	2.6	3	....	....	....	....	....	....	2.4	[11]0.1
Alderson West, 6-2-16-15 w4m	6.0	2.1	[7]1	....	....	....	....	....	....	....	....
Bassano Lathom, 10-5-22-18 w4m	25.0	4.5	[31]5	....	....	....	....	....	....	....	[11]0.7
Carseland, 16-21-22-25 w4m	12.0	6.9	3	....	....	....	....	....	....	....	[11]0.1
Countess 10-20-18-15 w4m	8.0	3.1	[7]2	....	....	....	....	4.5	....	....	[11]2.2
Countess Makepeace, 12-33-22-18 w4m	50.0	9.4	3	....	....	....	....	....	....	....	[11]1.8
Entice, 10-7-28-23 w4m	7.0	1.5	3	....	....	....	....	....	....	....	[11]<0.1
Ferrybank, 2-1-44-28 w4m	26.0	10.4	3	....	....	....	....	....	....	....	[11]4.3
Gilby Cantex Nortun, 6-21-40-2 w5m	2.1	0.4	3	....	....	....	....	....	....	....	[11]0.2
Hallkirk, 03-36-37-17 w4m	3.0	0.5	3	....	....	....	....	....	....	2.9	....
Hussar Crowfoot, 14-1-24-22 w4m	28.0	7.0	3	....	....	....	....	1.5	....	....	[11]1.6
Long Coulee, 6-30-15-21 w4m	8.2	1.6	[7]2	....	....	....	....	....	....	....	[11]0.4
Redland, 1-20-28-21 w4m	20.0	8.7	3	....	1.0	....	1.7	....	....	....	[11]2.8
Rycroft, 8-25-77-06 w6m	4.0	2.5	[7]2	....	....	....	....	....	....	1.3	....
Tide Lake, 16-10-18-10 w4m	10.0	2.1	3	....	....	....	....	....	....	....	....
Wayne Dalum, 5-17-27-19 w4m	19.0	3.6	[31]5	....	....	....	....	....	....	....	[11]0.7
Wintering Hills, 1-18-25-17 w4m	20.0	3.8	3	....	....	....	....	....	....	....	[11]1.0
Petro-Canada Inc.—											
*Bellshill, Lake 3 28-41-12 w4m	3.0	2.8	[7]2	....	....	....	....	....	6.0	....	....
*Brazeau River, 4-31-48-12 w5m	24.0	21.7	3	....	....	....	....	....	42.2	....	....

Company, plant, location	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
*Brazeau River, sw¼ 31-48-12 w5m	27.5	23.4	[7-35]2	....	....	....	....	....	38.7	....	....
Connorsville, 9 32-25-15 w4m	30.0	7.4	3	....	....	....	....	....	....	0.2	....
Empress, ne¼ 11-20-1 w4m	2,400.0	1,576.4	7	970.6	420.3	73.4	87.8	....	....	63.9	....
Ferrier, 9 22-39-8 w5m	8.0	4.8	3	....	....	....	....	....	5.7	....	....
Gilby No. 1064, Fina, 7 27-40-3 w5m	4.2	1.0	[35]1-6	....	....	....	....	....	....	0.2	....
Gilby No. 1130, 2 27-40-3 w5m	25.0	8.4	[7]2	....	....	....	....	....	5.1	....	....
Gilby No. 1156, Medicine River, 5-40-3 w5m	28.0	12.6	[7]2	....	....	....	....	....	14.8	2.6	....
Gold Creek, nw¼ 13 26-67-5 w6m	36.5	9.8	[7]2	....	....	....	....	....	....	22.2	....
Greencourt, se¼ 9 26-59-9 w5m	37.0	9.0	[7]1-[32]5	....	....	....	....	....	....	2.1	....
Kaybob, 8 9-64-19 w5m	124.5	66.1	[7]2	....	....	....	....	....	53.2	17.4	....
Rainbow, 15 7-108-6 w6m	14.3	5.3	3	....	....	....	....	....	....	<0.1	....
Sedgewick, 2 16-42-12 w4m	6.0	1.4	[21-13]1	....	....	....	....	....	....	....	....
Whitecourt, 12 26-59-11 w5m	64.6	28.5	[7]1-[32]5	....	....	....	....	....	....	5.2	....
Wildcat Hills, sw¼ 6 16-26-5 w5m	110.0	65.0	[21]1-[32]5	....	....	....	....	....	....	17.9	....
Phillips Petroleum Canada Ltd.—*Gilby, LSD 6-36-40-3 w5m	2.7	2.0	6	....	....	....	....	....	0.9	....	....
Placer Cego Petroleum Ltd.—											
Elnora, 13-14-34-22	4.0	3.5	[26]2	....	....	....	....	....	1.0	....	....
Provost, 4-16-33-07 w4m	5.5	2.2	[26]2	....	....	....	....	....	....	....	[11]0.1
Sedalia, 9-29-31-05 w4m	8.0	6.9	[32]5	....	....	....	....	....	....	....	[11]0.1
Steveville, 2-31-22-11 w4m	2.0	3.0	[32]5	....	....	....	....	....	....	....	[11]0.2
Wood River, 16-08-43 2 w4m	5.0	1.0	[32]5	....	....	....	....	....	....	....	[11]0.2
Saratoga Processing CL—Coleman, 11-8-5 w5m	35.0	18.5	[21]1	....	....	....	....	....	....	....	....
Sceptre Resources Ltd.—											
Cessford, 7-17-26-14 w4m	7.5	1.7	3	....	....	....	....	....	....	....	[11]0.3
Holmberg, nw¼ 13 14-44-17 w4m	11.5	8.8	[33]2	....	....	....	....	....	....	....	[11]0.3
Huxley, 6-17-34-24 w4m	12.5	4.1	[32]5	....	....	....	....	....	....	....	[11]0.9
Judy Creek, 1-21-63-11 w5m	3.0	0.3	4	....	....	....	....	....	....	....	[11]<0.1
Stanmore, 5-1-29-12 w4m	30.0	10.6	3	....	....	....	....	....	....	....	[11]1.5
Shell Canada Ltd.—											
Burnt Timber 1 and 2, 13-30-7 w5m	114.0	66.7	[33]1-3	....	....	....	....	....	....	7.8	....
Cranberry Lower Debolt, 4-20-96-3 w6m	14.0	8.7	[29]1-4	....	....	....	....	....	....	....	....
Cranberry Slave Point, 4-20-96-3 w6m	17.0	5.8	3-4	....	....	....	....	....	4.0	1.1	....
Gordondale, 24-79-11 w5m	14.6	2.8	[13]1-6	....	....	....	....	....	....	1.7	....
Hope Creek, 17-64-13 w5m	3.2	1.8	[29]1-3	....	....	....	....	....	....	3.2	....
House Mountain, 8-70-10 w5m	4.5	1.1	[29]1-3	....	....	....	....	....	18.3	....	....
Innisfail, 3-35-1 w5m	13.0	4.3	[19]1-3	....	....	....	....	....	....	4.1	....
Jumping Pound, nw¼ 13-25-5-w5m, se¼ 23-25-5 w5m, sw¼ 24-25-5 w5m	200.0	158.0	[29]1-2-7	71.5	41.6	....	35.8	....	....	102.9	....
Pouce Coupe, 8-80-12 w6m	3.0	0.8	[11]1-6	....	....	....	....	....	....	0.4	....
Simonette, 6-63-25 w5m	27.0	5.6	[29]1-3	....	....	....	....	....	7.4	13.8	....
South Rosevear, ne 11-54-15 w5m	50.0	21.1	[29]1-3	....	....	....	....	....	....	6.8	....
Waterton 1-2 and Straddle s½ 20-4-30 w4m, n½ 17-4-30 w4m, se¼ 24-4-1-w5m	315.0	199.0	[29]1-3-7	166.8	87.6	....	76.6	....	....	251.0	....
Star Oil & Gas Ltd.—											
Grassland, 6-13-68-18 w4m	2.0	1.0	4	....	....	....	....	....	....	....	....
Pouce Coupe, 11-34-79-12 w6m	10.0	6.0	3	....	....	....	....	4.0	....	....	....
Redwater, 8-25-57-23 w4m	6.2	3.0	2&4	....	....	....	....	....	....	....	....
Sunnybrook, Bell River Pool 15-22-48-2 w5m	5.0	2.5	3&4	....	....	....	....	....	0.5	....	....
Sylvan Lake, Basal Quartz, Glauc., 16-19-38-1 w5m	8.0	6.0	[13]1-3-4	....	....	....	....	5.9	....	....	....
Steen Resources Ltd.—Crossfield, 8-20-30-3 w5m	4.0	3.0	4	....	....	....	....	....	....	....	[11]4.2
Suncor Inc.—											
Calling Lake South, 1-20-70-20 w4m	10.0	3.8	[3-7]1-4	....	....	....	....	....	....	....	....
Countess-Duchess, Newell Co., LSD 08-36-20-16 w4m	21.0	4.3	4-[27]5	....	....	....	....	0.2	....	....	....
Enchant, Taber Co., LSD 11-35-13-17 w4m	20.0	9.9	4-[27]5	....	....	....	....	0.6	....	....	....
Joffre, LSD 13-12-38-12 w4m	6.4	3.0	3	....	....	....	....	....	4.2	....	....
Killam, Flagstaff 29, LSD 12-23-42-11 w4m	20.0	0.8	4-[27]5	....	....	....	....	<0.1	....	....	....
Northwest Jenner, Imperial Dist., LSD 9-21-21-9 w4m	7.0	1.0	4-[27]5	....	....	....	....	....	....	....	....
Pine Creek, 10-23-57-19	13.5	NR	[26]2	....	....	....	....	27.7	....	....	....
Sibbald, LSD 5-6-28-2 w4m	7.5	1.0	4-[27]5	....	....	....	....	<0.1	....	....	....
Suncor Rosevear, ne¼ 16-33-54-15 w5m	30.0	12.5	[3-7]1 [2-32]5	....	....	....	....	....	....	3.5	....
Thorsby, 4-27-49-1 w5m	15.0	NR	[26]2	....	....	....	....	19.0	....	....	....
Texaco-Canada Resources—											
Battle Lake, 23-46-2 w5m	5.5	0.9	3	....	....	....	....	0.4	....	....	....
*Bonnie Glen Cycle, 17-47-27 w4m	140.0	131.1	7	....	95.6	16.4	38.9	....	....	93.4	....
Bonnie Glen Gas No. 1, 17-47-27 w4m	50.0	25.1	[19]2	....	25.1	....	30.9	....	....	25.4	....
Bonnie Glen Gas No. 2, 17-47-27 w4m	50.0	36.2	3	199.1	148.7	25.6	54.0	....	....	51.6	....
Cynthia, 13 22-49-10 w5m	10.5	4.8	3	....	....	....	....	10.2	....	2.3	....
Gilby, 15-22-40-3 w5m	58.0	19.9	[19]1	....	11.8	....	9.0	....	....	9.4	....
Magee, 11-20-42-25 w4m	6.0	4.2	3	....	....	....	....	3.7	....	....	....
Open Creek 10-34-42-5 w5m	8.0	3.4	3	....	....	....	....	....	4.2	....	....
Wabasca, 16-36-80-25 w4m	6.0	4.0	4	....	....	....	....	....	....	....	....
Willesden Green, 17-42-6 w5m	12.2	8.6	3	....	....	....	....	12.1	....	5.1	....
Total Petroleum Canada Ltd.—											
Gilby, 10 12-41-3 w5m	8.0	3.2	[7]1-4-[32]5	....	....	....	....	....	....	....	[11]0.9
Hythe, 16-21-73-10 w6m	8.5	8.0	3-4	....	....	....	....	5.5	....	....	[11]3.9
Sutton 7 21-90-4 w6m	3.0	1.3	[13]1-4	....	....	....	....	....	....	....	....
Ulster Petroleums Ltd.—											
Huxley, 7-17-35-24 w4m	3.0	1.5	4	....	....	....	....	....	....	....	....
Irvine, Medicine Hat, 1-23-12-2 w4m	3.5	1.0	4	....	....	....	....	....	2.6	....	....
Rumsey, 8-12-34-21 w4m	5.0	4.0	3-4	....	....	....	....	....	....	....	....
Wainwright East GGS, 11-34-44-6 w4m	4.0	1.5	4	....	....	....	....	....	....	....	....
Union Pacific Resources Inc.—											
Baptiste Lake, 14-34-65-24 w4m	22.0	6.0	[7]1	....	....	....	....	....	....	....	....
Cynthia Pembina, 9-16-51-11 w5m	1.2	1.0	3	....	....	....	....	....	1.8	....	....
Westcoast Transmission CL—Ferrier Cardium 2, LSD 1-20-39-7 w5m	23.0	8.2	3	....	....	....	....	....	....	....	....
Western Decalta Petroleum Ltd.—											
Breton, LSD 9-36-47-4 w5m	3.5	1.5	3	....	....	....	....	2.2	....	....	....

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Compeer, 6-36-33 2 w4m	5.0	1.8	^{28}1	....	....	....	....	....	....	....	....
Diamond Valley, 10-12-19-2 w5m	20.0	17.3	7	40.9	28.0	....	16.7	....	....	15.9	....
Hotchkiss, North, LSD 3 35-94-2 w6m	16.0	7.7	^{34}1	....	....	....	....	....	....	....	....
Total	**21,905.8**	**12,328.2**		**4,894.3**	**1,762.0**	**115.4**	**928.4**	**905.1**	**4,877.1**	**2,504.7**	**196.3**

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†Fractionation. (Figures in parenthesis do not represent primary production, and are not added in state totals). §And condensate.

British Columbia

Amoco Canada Petroleum CL—Inga, 3-31-86-23 w6m	5.0	0.1	^{13}1-4	....	....	....	....	....	....	....	....
Dome Petroleum Ltd.—Buick Creek North, 6-31 e-94 A-14	7.1	2.4	4	....	....	....	....	....	....	....	....
Dahl, a-89 H-94 H-7	7.0	1.0	4	....	....	....	....	....	....	....	....
Laprise, a-40 e-94 H-5	31.8	13.5	4	....	....	....	....	....	....	....	....
Velma, a-89 D-94 H-8	12.1	0.3	4	....	....	....	....	....	....	....	....
Esso Resources Canada Ltd.—Boundary Lake, 1-2-85-14 w6	17.5	8.1	2	....	13.7	....	9.0	....	....	3.9	....
Mobil Oil Canada Ltd.—Sierra, c-91-D 94-I-14	310.0	155.0	4-^{23}5	....	....	....	....	....	....	....	....
Petro-Canada Explorations Inc.—Taylor, 3-25& 26-82-18 w6m Plan 7891, Peace River	550.0	354.2	^{1}1^{21}5	....	27.4	....	43.9	....	....	56.8	^{10}52.5
Westcoast Transmission CL—Boundary Lake, A-10-25 15 w6m	8.9	1.5	^{21}1	....	....	....	....	....	....	....	....
Fort Nelson, Lot 2683, Peace River	750.0	338.0	$^{7\text{-}14\text{-}21}$1	....	....	....	....	....	....	....	....
Pine River, Lot 1156, Peace River	140.0	40.7	^{33}1	....	....	....	....	....	....	....	....
Sikanni, Lot 3472, Peace River	70.0	27.5	^{7}1	....	....	....	....	....	....	....	....
Taylor, 2 36-82-18 w4m Peace River Dist., Plan 7891	385.0	NR	7	....	106.2	....	39.1	....	....	14.6	....
Total	**2,294.4**	**1,250.3**		....	**147.3**	....	**92.0**	....	....	**75.3**	**52.5**

Northwest Territories

Amoco Canada Petroleum Cl—Pointed Mountain, 95-85-n24	188.0	21.0	^{13}1-4	....	....	....	....	....	....	....	....
Esso Resources Canada Ltd.—Norman Wells	8.0	1.1	5	....	....	....	....	....	....	....	....
Total	**196.0**	**22.1**		....	....	....	....	....	....	....	....

Saskatchewan

Anderson Exploration Ltd.—Greenan, 11-12-16-16 w3m	2.0	1.0	4	....	....	....	....	....	....	....	....
Dome Petroleum Ltd.—Steelman, w½-21-4-5 w2m	15.0	14.3	7	39.2	....	....	....	....	80.9	....	....
Esso Resources Canada Ltd.—Smiley, 8-9-31-25 w3m	3.0	0.4	3	....	....	....	....	....	0.5	....	....
ICG Resources Ltd.—Hatton, 4-15-14-27 w3m	9.0	8.0	3-4	....	....	....	....	....	....	....	....
Totnes, 15-33-027-18 w3m	2.5	1.5	4	....	....	....	....	....	....	....	....
Mobil Oil Canada Ltd.—Gull Lake, 9-5-14-19 w3m	1.9	1.1	4-^{23}5	....	....	....	....	....	....	0.3	....
North Canadian Oils Ltd.—Enterprise, 11-15-28 w3m	25.0	18.0	4	....	....	....	....	....	....	....	....
Golden Prairie, 11-36-14-29 w3m	12.0	11.0	4	....	....	....	....	....	....	....	....
Hatton, 6-28-14-29 w3m	22.0	18.0	4	....	....	....	....	....	....	....	....
Hatton East, 4-21-14-28 w3m	15.0	13.0	4	....	....	....	....	....	....	....	....
Horsham, 18-16-29 w3m	7.5	6.0	4	....	....	....	....	....	....	....	....
McLaren Lake, 35-15-29 w3m	1.5	1.5	4	....	....	....	....	....	....	....	....
Richmound, Hatton, 1-4-16-29 w3m	20.0	18.0	4	....	....	....	....	....	....	....	....
Sandhills, 34-13-25 w3m	15.0	13.0	4	....	....	....	....	....	....	....	....
Saskatchewan Power Corp.—Coleville, nw 17-31-23 w3m	38.4	20.6	^{19}2	....	....	....	....	....	....	....	^{11}12.4
Hoosier, se 16-30-28 w3m	3.0	0.9	^{31}5	....	....	....	....	....	....	....	^{11}<0.1
Success, 17-16-17 w3m	50.0	3.0	^{31}5	....	....	....	....	....	....	....	....
Star Oil & Gas Ltd.—Hatton 3, LSD 4 4-15-14-27 w3m	8.0	8.0	4	....	....	....	....	....	....	....	....
Hatton East, 16-19-13-26 w3m	9.6	9.6	4	....	....	....	....	....	....	....	....
Total	**280.4**	**166.9**		**39.2**	....	....	....	....	**81.4**	**0.3**	**12.4**

CHILE

Empresa Nacional del Petroleo—*Cullen, Magallanes, Primavera	150.0	100.0	^{19}2	....	52.0	....	37.0	....	....	23.8	....
Posesión-*Cabo Negro, Magallanes, San Gregorio	320.0	300.0	7	....	142.0	....	87.0	....	....	79.0	....
Total	**470.0**	**400.0**		....	**194.0**	....	**124.0**	....	....	**102.8**	....

CHINA, TAIWAN

Chinese Petroleum Corp.—Chingtsaohu plant and field, Hsin Chu area	60.0	3.1	7	....	....	....	....	....	1.6	....	....
Chinshui plant, field, and area	36.0	15.7	^{24}2	....	6.6	....	4.8	....	....	3.0	....
Chuhuangkeng plant, field, and area	75.0	35.3	^{14}1	....	....	....	....	....	....	....	....
Tung Hsiao plant, Tieh-Che-Shan field, Tung Hsiao area	100.0	51.6	7	41.2	23.2	1.9	12.1	....	....	11.9	....
Total	**271.0**	**105.7**		**41.2**	**29.8**	**1.9**	**16.9**	....	**1.6**	**14.9**	....

COLOMBIA

Empresa Colombiana de Petroleos—Barrancabermeja, Santander	100.0	79.0	7	102.5	....	....	....	33.0	....	....	....

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
Cicuco, Bolivar	40.0	12.0	3	....	....	....	....	4.3	....	2.5	....
GLP, El Centro, Santander	48.0	28.0	[16]2	....	19.0	....	17.0	....	....	25.0	....
[illegible]u, Norte Santander	62.0	9.0	3	....	....	....	....	11.0	....	7.0	....
International Petroleum Colombia Ltd.— Provincia, Santander	73.0	73.0	—[36]2	....	30.0	....	40.0	....	....	30.0	....
Total	**323.1**	**201.0**		**102.5**	**49.0**	....	**57.0**	**48.3**	....	**64.5**	....
DENMARK											
Dansk Naturgas A/S—Nybro, Ribe Amt Jutland	**450.0**	**240.0**	[33,35]1-3-6	....	....	....	....	....	....	....	[11]**100.0**
DOMINICAN REPUBLIC											
Falconbridge Dominicana C × A—*Bonao field, Arzo-Nouel Province, LaVega, La Peguera	NR	NR	....	....	....	....	....	....	....	....	[6]88.2 [10]189.0
Total	....	....		....	....	....	....	....	....	....	**277.2**
DUBAI											
Arco Oil & Gas Co.—Marghan	**330.0**	**330.0**	6	....	....	....	....	....	....	....	[11]**772.0**
ECUADOR											
CEPE—Ancon, Santa Elena field, Guayas	16.0	5.5	[1]1	....	....	....	....	1.1	....	5.6	....
Shushufindi, Napo Province	25.0	15.0	3	....	....	....	....	96.0	....	31.7	....
Total	**41.0**	**20.5**		....	....	....	....	**97.1**	....	**37.3**	....
EGYPT											
Amoco Egypt Oil Co.—Abu Gharadig/Dahshour, Abu Gharadig field, Western Desert, Block 30	125.0	101.7	7-8	....	....	....	....	76.0	....	....	[11]214.6
Egyptian General Petroleum Corp.—											
Abu Gharadig field, 286 km west of Cairo, Western Desert	148.0	137.0	[23]5-7	....	....	....	....	....	....	....	[11]301.1
Abu Madi LTS plant and field, K. Sheikh	254.0	250.0	[35]1-6	....	....	....	....	....	....	....	[11]228.4
Abu Madi LPG plant and field, K. Sheikh	250.0	250.0	[23]5-7	....	....	....	....	89.5	....	....	[11]23.1
Abu Qir plant and field offshore, 60 km east of Alexandria	250.0	240.0	5-7	....	....	....	....	64.8	....	....	[11]180.0
Dahshour, Abu Gharadig field, 65 km west of Cairo, Giza	137.0	130.0	7	....	....	....	....	120.0	....	....	....
Ras-Shukeir	170.0	140.0	[23]5-7	....	....	....	....	239.4	....	....	[11]147.6
Sinai, Balayim, Abu Rudies	25.0	22.0	[26]3	....	....	....	....	....	39.0	....	[11]19.0
Zeit Bay	90.0	68.0	[35]1-2	....	....	....	....	167.8	....	....	[11]63.0
Total	**1,449.0**	**1,338.7**		....	....	....	....	**798.5**	....	....	**1,176.8**
FRANCE											
SNEA—Usine de Lacq	**570.0**	**563.0**	1	....	**130.0**	....	**132.0**	....	....	**270.0**	....
GERMANY											
Mobil Oil AG—											
Norddeutsche Erdgas Aufbereitungs GmbH, Scholen Concession, Lower Saxony, Sulingen Province (50% MoAG)	270.0	250.0	[27,29,33]1								
Wintershall AG—Dueste 2-Staffhorst-Syke, Diepholz, Lower Saxony	35.0	18.0	[30]1	(sulfur recovery only)							
Dueste 3-Staffhorst-Syke, Diepholz, Lower Saxony	35.0	20.0	[30]1	(sulfur recovery only)							
Emlichheim, Lower Saxony	27.0	21.0	[6]2	(sulfur recovery only)							
Ruetenbrock, Ruetenbrock-Fehndorf, Haren, Lower Saxony	32.0	32.0	[29]1	(sulfur recovery only)							
Total	**399.0**	**341.0**									
GREECE											
North Aegean Petroleum Co.—*Sigma site, Prinos and South Kavala field	**10.5**	**9.4**	[9]1-[12]5	....	....	....	....	....	**88.8**	....	....
HUNGARY											
OKGT:											
Babócsa plant and field, Somogy	7.0	6.6	6	....	....	....	....	....	....	....	[11]2.5
Berekfürdő, Tatárülés-Kunmadaras, Szolnok	28.3	11.5	6	....	....	....	....	....	....	....	....
*Demjén plant and field, Heves	5.1	1.8	5	....	....	....	....	....	....	....	[11]0.2
Ebes plant and field, Hajdu-Bihar	8.5	4.5	6	....	....	....	....	....	....	....	[11]0.5
Endröd plant and field, Bekes	70.0	53.0	6	....	....	....	....	....	50.3	....	....
Hajduszoboszló plant and field, Hajdu-Bihar	77.7	33.2	[1]2	....	1.9	....	1.7	16.3	....	14.0	[9]7.8
Kardoskút plant, Pusztaföldvár field, Békés	42.4	13.6	3	....	....	....	....	....	9.6	....	....
Kiskunhalas plant and field, Bács-Kiskun	7.1	4.9	6	....	....	....	....	....	....	....	[11]0.1
Szank plant and field, Bács-Kiskun	77.7	33.2	3	....	....	....	....	....	17.8	....	....
Szeged plant, Algyö field, Csongrád	566.0	397.8	[1]2-3&6	....	48.8	5.8	50.1	108.5	....	158.8	[1]26.7 [8]20.2 [9]352.3
Tázlár plant and field, Bács-Kiskun	28.3	1.3	6	....	....	....	....	....	....	....	[11]5.0
Üllés plant and field, Csongrád	160.0	122.2	6	....	....	....	....	....	254.9	....	....
Total	**1,078.1**	**683.6**		....	**50.7**	**5.8**	**51.8**	**124.8**	**332.6**	**172.8**	**415.3**

Company, plant, location	MMcfd Gas capacity	MMcfd Gas throughput	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
INDONESIA											
Atlantic Richfield Indonesia Inc.—Ardjuna, nw Java Sea, 90 miles ne of Jakarta	180.0	97.0	7	....	328.9	....	....	....	....	185.1	[11]305.7
....	....	....	....	....							
Petromer Trend Corp.—Arar, Arar-Klalin field, Irian Jaya Province, Kepala Burung	15.0	12.0	6	....	....	....	....	....	....	20.0	....
Walio, Irian Jaya Province, Kepala Burung	2.5	2.5	6	....	....	....	....	....	....	4.0	....
Petromina—Mundu, Jatibarang, West Java	35.0	23.5	3	....	....	....	....	33.0	16.2	....	....
Rantau, North Sumatra	28.0	17.5	1	....	....	....	....	18.6	....	....	....
Total Indonesie—Handil CPA, East Kalimantan	200.0	160.0	[12-13]2	....	....	....	....	....	75.0	....	....
Senipah Terminal, East Kalimantan	25.0	20.0	[13]1	....	....	....	....	....	16.0	....	....
Unocal—Santan LEX, Attaka, East Kalimantan	145.0	122.0	7	....	129.0	....	....	....	178.0	....	....
Total	**630.5**	**454.5**		....	**129.0**	....	....	**51.6**	**285.2**	**209.1**	**305.7**
ITALY											
AGIP SPA—Brugherio, Po Valley	300.0	10.0	1	....	....	....	....	....	....	....	....
Casalborsetti, Porto Garibaldi field, Bologna, Emilia-Romagna, Po Valley	794.0	382.0	1	....	....	....	....	....	....	0.1	....
Casirate d'Adda, Malossa field, Bergamo, Lombardia, Po Valley	20.0	9.0	2	....	....	....	....	2.7	53.4	....	....
Cortemaggiore, Piacenza, Po Valley	106.0	24.0	1	....	....	....	....	....	....	0.4	....
Crotone, Luna field, Catanzaro, Calabria	265.0	172.0	1	....	....	....	....	....	....	<0.1	....
Falconara, Barbara 'A' field, Ancona	176.0	52.0	1	....	....	....	....	....	....	....	....
Fano, Basil, Pesaro	88.0	16.0	1	....	....	....	....	....	....	....	....
*Gagliano, Enna, Sicily	141.0	11.0	5	....	....	....	....	....	....	6.5	....
Grottammare, Emilio-David field, Ascoli Piceno	114.0	45.0	1&2	....	....	....	....	....	....	0.1	....
Hera Lacinia, Crotone, Catanzaro	88.0	4.0	1	....	....	....	....	....	....	....	....
Minerbio, Bologna, Po Valley	1,592.0	122.0	1	....	....	....	....	....	....	<0.1	....
Pineto, Fratello-Squalo-Emma field, Roseto, Pescara	176.0	88.0	1	....	....	....	....	....	....	....	....
Ravenna Mare, Porto Corsini Est-Angela fields, Bologna, Emilia Romagna, Po Valley	354.0	292.0	1	....	....	....	....	....	....	0.2	....
Ripalta, Cremona, Po Valley	353.0	30.0	1	....	....	....	....	....	....	....	....
Rubicone, Cervia and Cesenatico fields, Bologna, Emilia-Romagna, Po Valley	265.0	134.0	1	....	....	....	....	....	....	0.3	....
Sergnano, Cremona, Po Valley	1,981.0	65.0	1	....	....	....	....	....	....	....	....
Settala, Po Valley	353.0	51.0	1	....	....	....	....	....	....	....	....
Total	**7,166.0**	**1,497.0**		....	....	....	....	**2.7**	**53.4**	**7.6**	....
KUWAIT											
Kuwait National Petroleum Co.—											
Mina Al-Ahmadi-1	†	†	†	....	(290.8)	(348.3)	....	....	....	(320.5)	....
Mina Al-Ahmadi-2	†	†	†	....	(541.5)	(648.5)	....	....	....	(596.8)	....
*Mina Al-Ahmadi	560.0	NR	1-[26-12]2 4-[23]5	....	1,722.0	....	980.0	....	....	811.8	....
Total	**560.0**	**448.0**		....	**1,722.0**	....	**980.0**	....	....	**811.8**	....

†Fractionation. (Figures in parenthesis do not represent primary production, and are not included in totals).

Company, plant, location	MMcfd Gas capacity	MMcfd Gas throughput	Process/ condition method	Production—1,000 gal/day (Average based on the past 12 months) Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
LIBYA											
Oasis Oil Co. of Libya Inc.—											
*Bahi, Concession 32	15.0	10.0	2&4	....	....	....	....	....	....	....	[11]160.0
*Dahra, Concession 32	140.0	20.0	2&4	....	....	....	....	....	....	....	[11]11.0
Defa, Concession 59 and 71	104.0	47.0	4	....	....	....	....	....	....	....	[11]210.0
Waha, Concession 59W	52.0	52.0	4	....	....	....	....	....	....	....	[11]170.0
Occidental of Libya, Inc.—											
103A, Sirte Basin, Petroleum Zone II	670.0	450.0	3	....	....	....	....	....	666.0	....	....
103D, Sirte Basin, Petroleum Zone II	420.0	255.0	3	....	....	....	....	....	375.0	....	....
Socialist People'- Libyan Arab Jamahirya, Marsa Brega	450.0	393.0	NR	....	....	....	....	37.8	4,536.0	....	....
Total	**1,851.0**	**1,227.0**		....	....	....	....	**37.8**	**5,577.0**	....	**551.0**
MALAYSIA											
Petronas—Dew Point Control Unit, Kerteh, Terengganu	250.0	90.0	6-7	....	20.0	20.0	....	....	....	60.0	....
LPG Unit, Kerth Kemaman, Terengganu	32.0	30.0	[19-26]2	....	120.0	100.0	....	55.0	....	90.0	....
Total	**282.0**	**120.0**		....	**140.0**	**120.0**	....	**55.0**	....	**150.0**	....
MEXICO											
Petroleos Mexicanos—Cactus, Chiapas (6 plants)	1,600.0	1,317.0	6-7	†1,569.7	‡3,494.0	....	....	....	....	....	....
Ciudad Pemex A, Tabasco	550.0	450.0	[19]2	†247.0	‡551.0	....	....	....	....	....	....
Cuidad Pemex C, Tabasco	200.0	165.0	7	†120.0	‡268.0	....	....	....	....	....	....
La Venta A, Tabasco	200.0	195.0	[19]2	†184.0	‡410.0	....	....	....	....	....	....
La Venta C, Tabasco	215.0	182.0	7	†308.0	‡687.0	....	....	....	....	....	....
Matapionche, Veracruz	30.0	38.0	3	....	....	....	....	....	....	....	[11]14.0
Nuevo Pemex, Tabasco	500.0	191.0	7	288.0	....	....	....	385.4	....	206.1	....
Pajaritos, Coatzacoalcos, Veracruz	192.0	136.0	7	209.5	....	....	....	....	....	....	....
Poza Rica, Veracruz	297.0	275.0	7	457.3	154.4	3.5	81.0	....	....	2.3	....
Reynosa, Tamaulipas	550.0	300.0	[19]2	104.2	92.1	....	72.0	....	....	108.1	....
Total	**4,334.0**	**3,248.0**		**3,487.7**	**5,657.2**	**3.5**	**153.0**	**385.4**	....	**316.5**	**14.0**

†Estimate. ‡Estimate, C_3+.

Company, plant, location	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
NETHERLANDS											
Amoco Netherlands Petroleum Co.—Alkmaar, (Koedijk), Bergen, Bergenmeer, Groet, Schermer, North Holland	**440.0**	**96.0**	[32]5	....	....	....	....	....	....	....	[11]**4.9**
NEW ZEALAND											
Natural Gas Corp. of New Zealand—*Kapuni, Taranaki, Lot 1. Dp 5227, Sec. 11, B-XVI, Kaupokouni SD area 11.2.27	100.0	57.0	[7]1-3	....	39.0	....	....	....	....	9.0	....
*Kapuni	152.0	37.0	3	....	....	....	....	....	....	....	....
Shell BP and Todd Oil Services Ltd.—Oaonui, New Plymouth	600.0	....	...	....	....	....	....	....	....	....	....
Total	**852.0**	**94.0**		....	**39.0**	....	....	....	....	**9.0**	....
NORWAY											
Amoco Norway Oil Co.—Valhall A, 56° 16' 41.395" North, 3° 23' 43.193" East	350.0	55.0	7	....	....	....	....	....	251.0	....	....
Statoil—Statpipe, Tysvaer, Rogaland	600.0	400.0	7	....	785.0	102.0	262.0	....	....	197.0	....
Total	**950.0**	**455.0**		....	**785.0**	**102.0**	**262.0**	....	**251.0**	**197.0**	....
OMAN											
Sultanate of Oman—Fahud	50.0	25.0	3	....	....	....	....	....	12.0	....	....
Rima	2.0	1.4	4-8	....	....	....	....	....	....	13.0	....
Saih Nihayda	80.0	24.0	3	....	....	....	....	....	5.0	....	....
Sayyala	14.0	7.0	4-8	....	....	....	....	....	....	30.0	....
Yibal	80.0	72.0	3	....	....	....	....	....	185.0	....	....
Yibal	†	†	†	....	(0.5)	....	(8.0)	....	....	....	....
Yibal A-B-X	200.0	80.0	3-6	....	....	....	....	....	....	....	....
Yibal C-D	200.0	100.0	6-7	....	....	....	....	....	....	....	....
Total	**626.0**	**309.0**		....	....	....	....	....	**202.0**	**43.0**	....

†Fractionation. (Figures in parenthesis do not represent primary production, and are not included in totals).

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
PAKISTAN											
Oil and Gas Development Corp.—Pirkoh field, Baluchistan province	†150.0	120.0	[35]1	....	....	....	....	....	....	....	....
Toot field, Punjab province	20.0	6.0	[35]1	....	....	....	....	....	....	....	....
Pakistan Oilfields Ltd.—*Meyel field, Attock district, Punjab province	40.0	15.0	[21]1	....	....	....	....	....	....	....	[11]6.3
*Meyel field, Attock district, Punjab province	75.0	22.0	4-[23]5-7	....	....	....	....	37.0	....	....	[6]2.7
Sui Gas Transmission CL—*Sibbi district, Baluchistan	670.0	630.0	1&5	....	....	....	....	....	....	....	[11]3.1
Sui Northern Gas Pipelines Ltd.—*Sibbi district Baluchistan	140.0	130.0	1	....	....	....	....	....	....	....	....
Total	**1,095.0**	**923.0**		....	....	....	....	**37.0**	....	....	**12.1**

†Three plants of 50.0 MMscfd capacity each.

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
PERU											
Petroleos del Peru—Pariñas-Pozo, Piura, Talara	70.0	37.0	2	....	....	....	....	....	....	....	....
Verdun, Pariñas, Piura, Talara	....	....	...	....	3.4	....	1.0	5.6	28.9	....	4.0
Total	**70.0**	**37.0**		....	**3.4**	....	**1.0**	**5.6**	**28.9**	....	**4.0**
QATAR											
Qatar General Petroleum Corp.—Umm Said No. 1, Dukhan field, onshore	339.0	142.0	[13]1-3 [7]5	....	236.4	....	123.4	....	....	66.0	....
Umm Said No. 2, offshore	240.0	87.0	[13]1-3 [7]5	....	215.6	....	154.8	....	....	136.0	....
Total	**579.0**	**229.0**		....	**452.0**	....	**278.2**	....	....	**202.2**	....
SAUDI ARABIA											
Arabian American Oil Co.†—Abqaiq	580.0	NR	3-4	....	....	....	....	....	....	....	....
Berri	600.0	NR	[9]1-3-4 [23]5	....	....	....	....	....	....	....	....
Ras Tanura	120.0	NR	[9]1-3-4 [23]5	....	....	....	....	....	....	....	....
Shedgum	1,500.0	NR	[9]1-3-4 [23]5	....	....	....	....	....	....	....	....
Uthmaniyah	1,500.0	NR	[9]1-3-4 [23]5	....	....	....	....	....	1,176.0	....	....
Total	**4,300.0**	....		....	....	....	....	....	**1,176.0**	....	....

†Design capacity. Fractionation plants located at Ju'Aymah, Ras Tanura, and Yanbu.

Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
SHARJAH											
Amoco Sharjah Oil Co.—Sajaa field	550.0	520.4	8	....	....	....	....	....	....	....	[11]1,174.7
Shalco LPG, Sajaa field	440.0	440.0	7	....	220.5	....	251.2	....	....	....	[11]166.7
Total	**990.0**	**960.4**		....	**220.5**	....	**251.2**	....	....	....	**1,341.4**

Christmas tree fits well into this pastoral scene near a gas processing plant in East Texas. (Photo by Union Pacific Resources Co.)

	MMcfd			Production—1,000 gal/day (Average based on the past 12 months)							
Company, plant, location	Gas capacity	Gas through-put	Process/ condition method	Ethane	Prop.	Isobut.	Normal or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other
SPAIN											
Repsol Exploración SA—											
*Gaviota P/F, Offshore Bermeo, Vizcaya, Concession I-II	186.0	38.0	[35]1	....	....	....	....	....	....	....	[11]42.0
*Machichaco, Gaviota, Bermeo, Vizcaya	186.0	38.0	[35]2	....	....	....	....	....	....	....	[11]52.0
*Serrablo Concession, Sabiñanigo, Huesca	56.0	17.0	[35]1	....	....	....	....	....	....	....	....
Total	**428.0**	**93.0**		....	....	....	....	....	....	....	**94.0**
THAILAND											
Petroleum Authority of Thailand—											
*Plant I, Rayong, Mabtapud Industry Estate	350.0	350.0	[14]1-3-4- [23]5-6-7	651.4	330.9	....	....	349.6	1.8	88.2	....
Plant II, Rayong, Mabtapud Industry Estate	660.0	205.0	3	....	....	....	....	....	5.5	....	[11]4.7
Total	**1,010.0**	**555.0**		**651.4**	**330.9**	....	....	**349.6**	**7.3**	**88.2**	**4.7**
UNITED KINGDOM											
Amoco U.K.—Bacton, Gordon-Forbes-Esmond, 43/8 13, 15	370.0	350.0	3	....	....	....	....	....	....	....	[11]30.0
Bacton, Leman 49/26 27, 28&53/1-2	1,200.0	586.0	3	....	....	....	....	....	....	....	[11]15.7
Bacton, Indefatigable 49/18 19-23&24, Norfolk Co.	600.0	337.0	3	....	....	....	....	....	....	....	[11]24.8
Northwest Hutton, 211/27	43.2	0.5	7	....	....	....	....	....	36.0	....	....
BP Petroleum Development UK Ltd.—Easington and West Sole, Block 48/6, Southern North Sea	300.0	168.0	1-2 4-5	....	....	....	....	....	....	....	[12]11.8
Kinneil, Forties Field	70.0	48.0	4	....	332.0	....	291.0	....	....	176.0	....
Shell UK Exploration & Production—											
Bacton, Norfolk, Southern North Sea	662.0	....	...	....	....	....	....	....	....	....	....
Mossmorran, Fife, North Sea	....	....	†	(Processed 2,492,493 tons NGL feedstock only)					....	....	....
St. Fergus, Aberdeenshire, North Sea	760.0	....	...	....	....	....	....	....	....	....	....
Total Oil Marine Ltd.—Saint Fergus, Frigg field, Grampian province	65.0	46.0	3	....	....	....	....	....	....	1,572.5	....
Total	**4,070.2**	**1,535.5**		....	**332.0**	....	**291.0**	....	**36.0**	**1,748.5**	**82.3**
VENEZUELA											
Corpoven											
Guara Oeste, Anzoategui	42.0	45.0	1	....	....	....	....	15.0	....	11.5	....
Jose, Oriente, Anzoategui	....	....	†	....	(996.0)	(264.4)	(316.7)	....	....	(336.8)	(17.0)
Oficina, Anzoategui	9.0	3.0	1	....	....	....	....	6.3	....	5.0	....
San Joaquin, Oriente, Anzoategui	800.0	870.0	7	....	....	....	....	....	1,930.9	....	....
Santa Rosa, Anzoategui	300.0	250.0	2	....	....	....	....	210.0	....	71.4	....
Lagoven											
Tia Juana 1, Zulia	230.0	210.0	1	....	....	....	....	....	180.2	....	....
Tia Juana 2, Zulia	450.0	450.0	3	....	....	....	....	....	640.2	....	....
Tia Juana 3, Zulia	455.0	380.0	3	....	....	....	....	....	300.7	....	....
Ule fractionation plant, Punta Gorda Zulia	....	....	†	....	(408.2)	(68.9)	(281.8)	....	....	(362.0)	....
Maraven											
Bajo Grande fractionation plant, Zulia	....	....	†	....	(75.6)	....	(71.4)	....	....	(75.6)	....
El Tablazo, Zulia	165.0	134.0	7	213.3	168.0	....	88.2	....	....	67.2	....
*Lama Liquido, Zulia	150.0	120.0	3	....	....	....	....	....	197.4	....	....
Lamar Liquido, Zulia	162.0	25.0	3	....	....	....	....	....	25.2	....	....
La Paz, Zulia	150.0	70.0	1	....	29.4	....	25.2	....	....	16.8	....
Total	**2,913.0**	**2,557.0**		**213.3**	**197.4**	...	**113.4**	**231.3**	**3,274.6**	**171.9**	....

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†Fractionation.

†Parenthetical figures do not represent primary production, and are not added to totals. Jose plant fractionates raw NGL mix from San Joaquin and Santa Rosa plants. Ule plant fractionates all raw NGL mix from Lagoven plants. Bajo Grande plant fractionates raw NGL mix from Lama and Lamar Liquido plants.

World sulfur derived from oil, gas production

Ailleen Cantrell
Director of Editorial Surveys

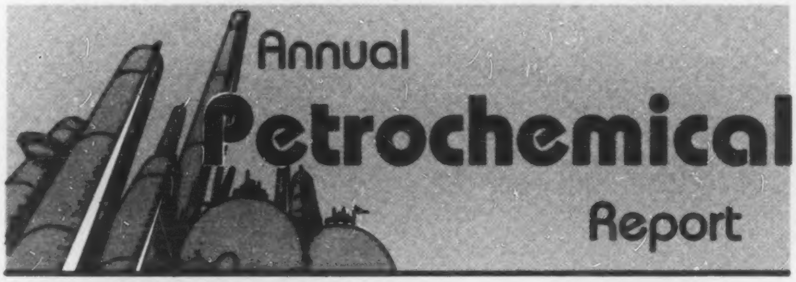
As of Jan. 1, 1988

Company and location	Source	Type of process	— Metric tons/day — Design capacity	Production
ABU DHABI				
Abu Dhabi National Oil Co.				
Thammama C, Habshan	nat. gas	3 bed Claus	800.0	266.0
Ruwais	ref. gas	2 bed Claus	93.0	22.0
ARGENTINA				
Duperial				
San Lorenzo	acid gas	Claus	44.2	0
Electroclor SAIC				
Capitan Bermudez, Santa Fe	carb. disulf	....	13.8	12.6
AUSTRALIA				
Caltex Refining CPL				
Kurnell, NSW	ref. gas	Claus	70.0	7.0
Petroleum Refineries Australia PL				
Adelaide	ref. gas	....	26.0	0.5
Altona	ref. gas	....	25.0	1.1
Shell Refining (Australia)				
Clyde, NSW	ref. gas	Claus-DEA	115.0	5.0
Geelong, Victoria	ref. gas	Claus-DEA	100.0	9.0
AUSTRIA				
OeMV AG				
Aderklaa	nat. gas	Claus	32.0	17.0
Schwechat	ref. gas	Claus	215.0	70.0
Schwechat	flue gas	Claus	34.0	....
BAHRAIN				
Bahrain Petroleum Co. BSC (Closed)				
Sitra	ref. gas	Mod. Claus	150.0	130.3
BELGIUM				
Belgian Refining Corp.				
Antwerp	ref. gas	Claus-DEA	108.5	20.0
Esso Belgium				
Antwerp	ref. gas	2 Claus 1 IFP	350.0	260.0
SIBP				
Antwerp	ref. gas	Claus	225.0	75.0
BRAZIL				
Petrobras				
Recap—Capuava, SP	crude oil	....	25.0	3.0
Refap—Canoas, RS	crude oil	....	20.0	17.0
Regap—Betim, MG	crude oil	....	60.0	31.0
Repar—Araucária, PR	crude oil	....	65.0	58.0
Replan—Paulínia, SP	crude oil	....	60.0	36.0
Revap—São Jose Campos, SP	crude oil	....	170.0	45.0
Petroflex SA				
Duque de Caxias, RJ	acid gas	Claus	40.0	30.0
Ultrafertil SA				
Araucária, PR	resid asphalt	Claus Pool 1500	57.8	36.0
Cubatão, SP	ref. gas acid gas	Claus	45.0	21.0
CANADA				
Amoco Canada Petroleum CL				
Bigstone, Al.	nat. gas	2 bed Claus	382.0	....
East Crossfield, Al.	nat. gas	3 bed Claus and CBA	1,673.7	....
West Whitecourt, Al.	nat. gas	2 bed Claus	1,225.0	....
Canadian Occidental Petroleum Ltd.				
Paddle River, Al.	nat. gas	....	25.4	8.0
Canterra Energy Ltd.				
Nordegg River, Al.	nat. gas	Mod. Claus 2 stage	40.0	22.0
Okotoks, Al.	nat. gas	Mod. Claus 2 stage	440.0	420.0
Rainbow Lake, Al.	oil and gas	Mod. Claus 2 stage	150.0	60.0
Ram River, Al.	nat. gas	Mod. Claus 2 stage Sulfreen	4,600.0	2,900.0
Chevron Canada Ltd.				
Burnaby, BC	ref. gas	Stretford	10.0	....
Chevron Canada Resources Ltd.				
Kaybob, South Al.	nat. gas	Mod. Claus	3,200.0	....
Chieftain Development CL				
Hythe-Brainard, Al.	nat. gas	MCRC	110.0	70.0
Dome Petroleum Ltd.				
Brazeau, Al.	nat. gas	Mod. Claus	118.2	40.0
Caroline, Al.	nat. gas	Mod. Claus	18.0	6.0
Edson, Al.	nat. gas	Mod. Claus	297.0	110.0
Kaybob I-II, Al.	nat. gas	Mod. Claus	1,097.0	450.0
Lone Pine, Al.	nat. gas	Mod. Claus	283.0	106.0
Sturgeon Lake, Al.	nat. gas	Mod. Claus	105.0	76.0
West Pembina, Al.	nat. gas	Mod. Claus	300.0	300.0
Zama, Al.	nat. gas	Mod. Claus	80.0	21.0
Esso Resources Canada Ltd.				
Joffre	solution gas	....	28.9	6.0
Quirk Creek	nat. gas	....	294.0	119.0
Redwater	solution gas	....	25.0	12.4
Gulf Canada Corp.				
Hanlan-Robb, Al.	nat. gas	Mod. Claus Sulfreen-TG	1,100.0	520.0
Nevis, Al.	nat. gas	Mod. Claus Sulfreen-TG	163.0	110.0
Rimbey, Al.	nat. gas	Mod. Claus	333.0	100.0
Strachan, Al.	nat. gas	4 bed Amoco Cold bed adsorption	1,000.0	450.0
Mobil Oil Canada Ltd.				
Harmattan, Al.	nat. gas	Claus 3 stage	515.0	71.0
Lone Pine Creek So., Al.	nat. gas	Claus 3 stage	157.0	57.0
Teepee Creek, Al.	nat. gas	Claus 2 stage	30.0	15.0
Wimborne, Al.	nat. gas	Claus 2 stage	182.0	119.0
Norcen Energy Resources Ltd.				
Minnehik-Buck Lake, Al.	nat. gas	Claus 2 stage	35.0	22.0
Petro-Canada Inc.				
Brazeau, Al.	nat. gas	3 bed MCRC	78.4	78.4
Gold Creek, Al.	nat. gas	Claus 2 stage	100.0	15.0
Wildcat Hills, Al.	nat. gas	Claus 2 stage	170.0	80.0
Petrogas Processing Ltd.				
Balzac, Al.	nat. gas	Amine Claus Sulfreen	1,700.0	750.0
Saratoga Processing CL				
Coleman, Al.	sour gas	Mod. Claus	400.0	231.0
Shell Canada Ltd.				
Sarnia, Ont.	ref. gas	Claus	35.0	15.0
Scotford, Al.	ref. gas	Claus	10.0	3.0
Vancouver, BC	ref. gas	Claus-Scot	15.0	5.0
Shell Canada Ltd.				
Burnt Timber, Al.	nat.gas	Claus	510.0	380.0
Innisfail, Al.	nat. gas	Claus	170.0	71.0
Jumping Pound, Al.	nat. gas	Claus	570.0	505.0
Progress, Al.	nat. gas	Claus-MCRC	13.0	6.0
Rosevear, Al.	nat. gas	Claus	170.0	58.0
Simonette, Al.	nat. gas	Claus	100.0	73.0
Waterton, Al.	nat. gas	Claus-Scot	2,900.0	2,143.0
Sulconam Inc.				
Montreal East, Que.	ref. gas	Claus	300.0	125.0
Suncor Inc.				
Ft. McMurray, Al.	oil sands	Claus 3 stage	815.0	315.0
Rosevear, Al.	nat. gas	....	....	40.0
Sarnia, Ont.	ref. gas	....	....	14.0
Syncrude Canada Ltd.				
Mildred Lake. Al.	oil sands	Mod. Claus 3 stage	530.0	*
	oil sands	Mod. Claus 3 stage	530.0	*
	oil sands	Mod. Claus 2 stage	700.0	*
	oil sands	Sulfreen TG	96.0	*
*Total production: 327,900				
Texaco Canada Resources Ltd.				
Bonnie Glen, Al.	solution gas	Mod. Claus	15.2	6.8
Westcoast Transmission CL				
Chetwynd, BC	sour gas	MCRC	1,034.0	316.0
Fort Nelson, BC	sour gas	Mod. Claus Sulfreen	650.0	247.0
Taylor, BC	sour gas	Mod. Claus	460.0	225.0
Western Decalta Petroleum Ltd.				
Hartell, Al.	nat. gas	Claus 3 stage	10.7	10.7
CHINA, TAIWAN				
Chinese Petroleum Corp.				
Kaohsiung-2	ref. gas	Parsons	45.0	2.0
Kaohsiung-3	ref. gas	Parsons	45.0	7.0
Kaohsiung-4	ref. gas	Amoco	117.0	16.0
Kaohsiung-5	ref. gas	Amoco	200.0	90.0
Kaohsiung-6	ref. gas	Amoco	200.0	68.0
Taoyuan-2	ref. gas	Amoco	120.0	20.0
Taoyuan-3	ref. gas	Amoco	200.0	55.0
COLOMBIA				
Empresa Colombiana de Petroleos				
Barrancabermeja	ref. gas	Claus	50.0	30.0
Barrancabermeja	ref. gas	Claus	15.0	10.0

Company and location	Source	Type of process	— Metric tons/day —	
			Design capacity	Production
DENMARK				
A/S Dansk Shell				
Fredericia	ref. gas	Claus	25.0	10.0
Kuwait Petroleum Refining Denmark A/S				
Gulfhavn	naph. & gas desulf	Claus	50.0	40.0
EGYPT				
Ameria Petroleum Refining Co.				
Alexandria	HDS gases	Claus	....	3.1
General Petroleum Co.				
Ras Gharib	assoc. gas	Claus	....	8.7
Suez Oil Processing Co.				
El-Suez	ref. gas coker gas	Claus	81.5	9.1
FINLAND				
Neste Oy				
Naantali	ref. gas	Claus	55.0	26.0
Porvoo	ref. gas	Claus	215.0	116.0
FRANCE				
Cie. de Raff. et de Distillation Total France				
Gonfreville l'Orcher	ref H_2S	Claus	190.0	67.2
La Mede	ref H_2S	Claus	190.0	40.0
Mardyck	ref H_2S	Claus	130.0	22.0
Cie. Rhenane de Raffinage				
Reichstett	refinery	Claus	55.0	20.0
Elf France				
Donges	refinery	Claus	210.0	77.0
Feyzin	refinery	Claus	118.0	37.3
Grandpuits	refinery	Claus	125.0	20.3
Esso SA Francaise				
Fos-sur-Mer	refinery	Claus	120.0	60.0
Shell Francaise				
Berre	refinery	Claus	210.0	50.0
Petit-Couronne	refinery	Claus	210.0	50.0
Ste. Francaise des Petroles BP				
Lavera	ref. gas	....	122.0	....
Ste. Francaise Hoechst				
Port Jerome	ref. gas	Claus	240.0	....
Ste. Nationale Elf Aquitaine				
Lacq	sour gas	Claus Sulfreen	....	2,390.4
GERMANY				
Deutsche BP AG				
Vohburg	gas oil	IFP TG and Claus	60.0	20.0
Deutsche Marathon				
Burghausen	ref. gas	Claus	33.0	15.0
Deutsche Shell				
Godorf	refinery	Claus-Scot	140.0	75.0
Harburg	refinery	Claus-Scot	78.5	21.0
Deutsche Texaco				
Heide	ref. gas	2 Claus Maxisulf	57.0	17.0
Erdgasaufbereitungsanlage				
Grossenkneten	nat. gas	....	2,100.0	1,527.0
Erdölraffinerie Ingolstadt AG				
Ingolstadt	gas oil	IFP TG and Claus	32.0	10.[illegible]
Erdol-Raffinerie Neustadt GmbH & Co. oHG				
Neustadt-Donau	refinery	Claus Sulfreen	89.0	16.0
Esso				
Ingolstadt	refinery	Claus Sulfreen	50.0	34.0
Karlsruhe	refinery	Claus Sulfreen	100.0	57.0
Mobil Oil AG				
Woerth	ref. gas	....	60.0	10.8
Mobil AG-Norddeutsche Erdgas Aufbereitungs				
Sulingen	nat. gas	Claus	1,050.0	680.0
OMW GmbH				
Karlsruhe	ref. gas	Claus Sulfreen	175.0	....
Ruhr Oel GMBH				
Gelsenkirchen	refinery	Claus-Scot & Sulfreen	445.0	132.0
Union Rheinische Braunkohlen Kraftstoff AG,				
Wesseling	ref. gas	Claus	375.0	50.0
Wintershall AG				
Dueste	nat. gas	Claus	320.0	125.0
Lingen	ref. gas	Claus	112.0	50.0
Mannheim	ref. gas	Claus	52.0	10.0
Ruetenbrock	nat. gas	Claus	7.4	7.1
GREECE				
Hellenic Aspropyrgos Refinery SA				
Aspropyrgos, Attiki	ref. gas	Claus	40.0	20.0
	ref. gas	Claus	200.0	....
Motor Oil Hellas				
Corinth	ref. gas	Claus	90.0	38.0
HUNGARY				
Danube Petroleum Refining Co.				
Szazhalombatta	ref. gas	Claus	77.0	60.0
Tisza Petroleum Refining Co.				
Leninvaros	ref. gas	Claus	24.0	10.6
ISRAEL				
Oil Refineries Ltd.				
Ashdod	refinery	Claus TGT	30.0	....
Haifa	FCC&visb	Claus TGT	60.0	....
Haifa	HDS	Claus TGT	60.0	....
ITALY				
Agip Raffinazione SpA				
Rho	ref. gas	Claus	50.0	31.6
Sannazzarro	ref. gas	Claus	90.0	36.0
Taranto	ref. gas	Claus	121.0	55.0
Venezia	refinery	Claus	50.0	24.0
API-Raffineria di Ancona SpA				
Falconara	ref. gas	Claus-1	41.0	35.0
	ref. gas	Claus-2	34.0	20.0
Esso Italiana				
Augusta	ref. gas	Claus	104.0	75.0
Trecate	refinery	Claus	99.0	30.0
Isab				
Melilli	refinery	....	310.0	....
Mediterranea				
Milazzo	ref. gas	Claus	100.0	....
Mobil Oil Italiana				
Naples	ref. gas	....	68.0	13.7
Saras				
Sarroch	ref. gas	Parsons	35.0	(spare)
Sarroch	ref. gas	Parsons	90.0	75.0
Stanic				
Livorno	ref. gas	Claus	60.0	....
Tamoil Italia				
Cremona	ref. gas	Claus	12.0	6.0
Cremona	ref. gas	Claus	30.0	11.0
JAPAN				
Asia Oil CL				
Sakaide	ref. gas	Parsons	80.0	40.0
Sakaide	ref. gas	Uhde	185.0	100.0
Yokohama	ref. gas	Parsons	200.0	0
Cosmo Oil CL				
Chiba	ref. gas	Parsons	600.0	260.0
Sakai	ref. gas	Parsons	140.0	50.0
Yokkaichi	ref. gas	Parsons	200.0	45.0
Fuji Oil CL				
Sodegaura, Chiba	ref. gas	Comprimo	150.0	115.0
Sodegaura, Chiba	ref. gas	Parsons	90.0	....
General Sekiyu KK				
Sakai	ref. gas	Claus Flexsorb SE amine	386.0	126.0
Idemitsu Kosan CL				
Aichi	ref. gas	Uhde	400.0	196.0
Chiba	ref. gas	Uhde-Parsons	800.0	265.0
Hokkaido	ref. gas	Comprimo	50.0	26.0
Hyogo	ref. gas	Parsons	230.0	105.0
Tokuyama	ref. gas	Girdler-Uhde	235.0	69.0
Kashima Oil CL				
Kashima	ref. gas	Parsons	420.0	100.0
Koa Oil CL				
Marifu	ref. gas	Parsons	45.0	24.9
Marifu	ref. gas	Comprimo	35.0	5.4
Osaka	ref. gas	Parsons	60.0	26.8
Kyokuto Petroleum Industries Ltd.				
Chiba	ref. gas	....	215.0	49.7
Nichimo Sekiyu KK				
Kawasaki	refinery	....	22.6	....
Nippon Mining CL				
Chita, Aichi	ref. gas	Uhde-Claus	150.0	60.0
Mizushima	ref. gas	Uhde-Claus	200.0	90.0
Mizushima	ref. gas	Comprimo Claus	200.0	90.0
Nippon Petroleum Refining CL				
Muroran	ref. gas	Parsons	420.0	107.0
Negishi	ref. gas	Parsons	320.0	135.0
Nippon Steel Chemical CL				
Oita	BTX refin.	....	3.0	3.0
Tobata	coke oven gas	....	2.1	2.1
Okinawa Sekiyu Seisei CL				
Okinawa City	refinery	....	300.0	180.0
Seibu Oil Co.				
Yamaguchi	refinery	....	320.0	....
Showa Oil Co.				
Kawasaki	fuel oil	....	80.0	....
Showa Yokkaichi Seikyu KK				
Yokkaichi	ref. gas	....	280.0	....
Toa Nenryo Kogyo KK				
Kawasaki	ref. gas	Claus	295.0	66.0
Wakayama	ref. gas	Claus	169.0	62.0
Toa Oil Co.				
Kawasaki	ref. gas	Claus	330.0	125.3

Company and location	Source	Type of process	— Metric tons/day — Design capacity	Production
KOREA				
Ssangyong Refining CL				
Onsan	ref. gas	Claus	43.8	28.0
KUWAIT				
Kuwait National Petroleum Co.				
Mina Abdullah	ref. gas	Claus	149.0	75.0
Mina Al-Ahmadi	ref. gas	Claus	1,205.0	340.0
Shuaiba	ref. gas	Claus	1,085.0	315.0
MEXICO				
Petroleos Mexicanos				
Azcapotzalco, DF	ref. gas	Claus	22.6	13.9
Cadereyta, Ver.	ref. gas	Claus	71.2	7.1
Cactus, Chis	nat. gas	Claus	1,302.0	612.0
Cuidad Madero, Tamps	ref. gas	Claus	54.8	21.9
Ciudad Pemex, Tab.	nat. gas	Claus	650.9	292.0
Matapionche, Ver.	nat. gas	Claus	27.1	13.1
Minatitlan, Ver.	ref. gas	Claus	71.2	9.9
Nuevo Pemex, Tab.	nat. gas	Claus	650.9	304.1
Poza-Rica, Ver.	nat. gas	Claus	126.6	53.8
Salamanca, Gto	ref. gas	Claus	153.4	18.6
Salina Cruz, Oax.	ref. gas	Claus	71.2	14.3
Tula, Hgo	ref. gas	Claus	153.7	11.6
NETHERLANDS				
BP Raffinaderij Nederland NV				
Rotterdam	ref. gas	Claus	172.0	73.0
Esso Nederland				
Rotterdam	refinery	Claus-TGC	564.0	250.0
Kuwait Petroleum Europoort BV				
Europoort	ref. gas	Claus	45.9	31.1
Nederlandse Aardolie Maat. BV				
Emmen	nat. gas	Sulfinol Claus	80.0	. . . .
Shell Nederland Raffinaderij				
Rotterdam	refinery	Claus	540.0	190.0
Texaco				
Pernis	ref. gas	Claus	90.0	34.0
NETHERLANDS ANTILLES				
Refineria Isla Curazao SA				
Emmastad	refinery	Mod. Claus	225.0	61.0
NORWAY				
Norske Shell a.s.				
Sola	refinery	Claus	20.0	4.0
Rafinor a.s.				
Mongstad	ref. gas	Claus	13.0	11.0
PORTUGAL				
Petrogal				
Lisbon	cat cracking gas	Claus	30.0	21.0
Sines	ref. gas	Claus	100.0	10.0
PUERTO RICO				
Yabucoa Sun Oil Co.				
Yabucoa	gas oil	Claus	60.0	35.0
QATAR				
Qatar Petrochemical Co.				
Umm Said	acid gas	Claus	140.0	146.0
SAUDI ARABIA				
Petromin				
Berri	associated gas	Claus	1,200.0	640.0
Ras Tanura	refinery	. . . .	270.0	71.0
Shedgum	associated gas	Claus	1,700.0	1,690.0
Uthmaniyah	associated gas	Claus	1,100.0	1,200.0
Petromin Mobil Refining Co.				
Yanbu	refinery	. . . .	300.0	200.0
Petromin Shell Refining Co.				
Jubail	refinery	. . . .	300.0	161.0
SINGAPORE				
Esso Singapore PvL				
Jurong	ref. gas	Claus	126.0	5.0
Mobil Oil Singapore PL				
Jurong	ref. gas	. . . .	110.0	25.0
Shell Eastern Petroleum				
Pulau Bukom	refinery	Claus	300.0	125.0
Singapore Petroleum CPvL*	ref. gas	Claus	257.0	80.0
Singapore Refining Co.	refinery		*217.0	65.0
Jurong	. . . .		. . . .	. . . .
*36.7% share in design capacity.				
SOUTH AFRICA				
Mobil Refining Co. of Southern Africa PL				
Durban	ref. gas	. . . .	70.0	25.0
National Petroleum Refiners of South Africa PL				
Sasolburg	crude	Claus	120.0	55.0
Shell & BP South Africa Petroleum Refineries PL				
Durban	ref. gas	. . . .	106.0	. . . .
SPAIN				
Petronor				
Muskiz, Vizcaya	ref. gas	Claus	229.0	83.0
Repsol Petroleo				
Cartagena	refinery	Claus	27.0	. . . .
La Coruña	refinery	Claus	49.0	1.2
Puertollano	refinery	Claus	80.0	22.0
Tarragona	refinery	Claus	144.0	59.0
Union Explosivos Rio Tinto SA				
La Rábida, Huelva	ref. gas	Claus	12.0	8.0
SWEDEN				
BP Raffinaderi Goteburg AB				
Gothenburg	ref. gas	. . . .	6.0	. . . .
Shell Raffinaderi BV				
Gothenburg	refinery	Claus	27.0	9.0
Skandinaviska Raffinaderi AB				
Lysekil	refinery fuel	Claus	225.0	125.0
SWITZERLAND				
Raffinerie de Cressier SA				
Cressier	refinery	Claus	20.0	10.0
TURKEY				
Tupras				
Izmir	ref. gas	Claus	14.2	3.0
Izmit	ref. gas	Claus	45.0	5.2
Kirikkale	ref. gas	Claus	23.2	0.5
UNITED KINGDOM				
Amoco U.K.				
Milford Haven	refinery	Claus	76.0	. . . .
BP Oil				
Grangemouth	ref. gas	. . . .	100.0	. . . .
Llandarcy	ref. gas	. . . .	45.0	. . . .
Conoco Ltd.				
South Humberside	ref. gas	. . . .	50.0	35.0
Esso Petroleum CL				
Fawley	ref. gas	Claus	270.0	140.0
Gulf Oil Refining Ltd.				
Milford Haven	ref. gas	. . . .	10.0	4.1
Lindsey Oil & Refining Ltd.				
Killingholm, South Humberside	ref. gas	Claus	120.0	64.0
Mobil Oil CL				
Coryton	ref. gas	. . . .	200.0	15.6
Pembroke Cracking Co.				
Pembroke	ref. gas	Claus	160.0	19.5
Shell U.K. Oil				
Shell Haven	ref. gas	Claus	130.0	20.0
Stanlow	ref. gas	Claus	250.0	45.0
UNITED STATES				
Amoco Oil Co.				
Mandan, ND	ref. gas	Claus	15.0	. . . .
Texas City, Tex.	ref. gas	Claus	1,400.0	. . . .
Whiting, Ind.	ref. gas	Claus	400.0	. . . .
Yorktown, Va.	ref. gas	Claus	56.0	. . . .
Amoco Production Co.				
Andrews County, Tex.	nat. gas	2 bed Claus and CBA	21.8	18.0
Andrews County, Tex.	nat. gas	2 bed Claus	5.5	3.7
Ector County, Tex.	nat. gas	2 bed Claus	30.0	24.4
Eddy County, NM	nat. gas	2 bed Claus	36.0	34.0
Fremont County, Wyo.	nat. gas	2 bed Claus	61.0	17.[illegible]
Hockley County, Tex.	nat. gas	2 bed Claus	43.0	27.5
Hockley County, Tex.	nat. gas	Locat	9.0	. . . .
Park County, Wyo.	nat. gas	2 bed Claus	76.0	57.6
Sweetwater Co., Wyo.	nat. gas	Locat	2.0	2.0
Uinta County, Wyo.	nat. gas	2 bed Claus and CBA	1,205.0	965.8
Van Zandt, Tex.	nat. gas	3 bed Claus	313.0	154.9
Wood County, Tex.	nat. gas	2 bed Claus	30.0	12.6
Yoakum County, Tex.	nat. gas	Locat	14.0	3.0
Arco Petroleum Products Co.				
Carson, Cal.	ref. gas	Claus	180.0	150.0
Ferndale, Wash.	ref. gas	Claus	170.0	165.0
Ashland Petroleum Co.				
Canton, Oh.	refinery	Claus	50.8	19.8
Catlettsburg, Ky.	refinery	Claus	203.2	110.2
St. Paul Park, Mn.	refinery	Claus	38.6	14.1
BP Oil Corp.				
Belle Chasse, La.	ref. gas	Claus-Scot	50.0	. . . .
Marcus Hook, Pa.	ref. gas	Claus-Scot	160.0	. . . .
Cenex				
Laurel, Mont.	ref. gas	Claus	48.7	20.0
Champlin Refining Co.				
Corpus Christi, Tex.	crude oil	Claus-Scot	250.0	170.0
Chevron U.S.A. Inc.				
Carter Creek, Wyo.	nat. gas	Claus	907.0	. . . .
El Paso, Tex.	ref. gas	Claus	42.0	. . . .
El Segundo, Cal.	ref. gas	Claus	750.0	. . . .
Pascagoula, Miss.	ref. gas	Claus	1,000.0	. . . .
Philadelphia, Pa.	ref. gas	Claus	46.0	. . . .

Company and location	Source	Type of process	— Metric tons/day —	
			Design capacity	Production
Port Arthur, Tex.	ref. gas	Claus	460.0	....
Richmond, Cal.	ref gas	Claus	600.0	....
Salt Lake City, Ut.	ref. gas	Claus	12.0	....
Citgo Petroleum Corp.				
Lake Charles, La.	ref. gas	Claus-BSRP	330.0	330.0
Coastal Refining & Marketing Inc.				
Corpus Christi, Tex.	ref. gas	Claus	85.0	60.0
Conoco				
Commerce City, Colo.	ref. gas	Claus	19.0	16.0
Westlake, La.	ref. gas	Claus	290.0	195.0
Crown Central Petroleum Corp.				
Pasadena, Tex.	ref. gas	Claus	15.2	11.9
Diamond Shamrock Corp.				
Moore County, Tex.	nat. gas	Claus	30.5	14.7
El Paso Hydrocarbons Co.				
Foster, Ector County, Tex.	nat. gas	Claus	20.0	11.5
El Paso Natural Gas Co.				
San Juan County, NM	nat. gas	Mod. Claus	53.0	21.2
Enron Corp.				
Hobbs, N.M.	nat. gas	Mod. Claus	26.0	10.0
Exxon Co.				
Atascosa County, Tex.	nat. gas	2 reactor split flow Claus	...	4.8
Baton Rouge, La.	refinery	Claus	599.0	251.0
Baytown, Tex.	refinery	Claus	1,123.0	619.0
Benicia, Cal.	refinery	Claus	275.0	142.0
Crane County, Tex.	nat. gas	2 reactor Claus	....	13.2
Escambia County, Ala.	nat. gas	3 reactor Claus	....	764.6
Linden, NJ	refinery	Claus	393.0	150.0
Lincoln and Sweetwater Counties, Wyo.	nat. gas	Claus	....	944.8
Santa Rosa County, Fla.	nat. gas	3 reactor Claus	....	183.7
Farmland Industries Inc.				
Coffeyville, Kan.	refinery	Claus	19.8	8.1
Fina Oil & Chemical Co.				
Big Spring, Tex.	ref. gas	Claus	50.0	35.0
Port Arthur, Tex.	ref. gas	Claus-Scot	182.0	44.0
Fletcher Oil & Refining Co.				
Carson, Cal.	ref. gas	Locat	10.0	3.0
Frontier Oil & Refining Co.				
Cheyenne, Wyo.	ref. gas	Claus-Scot	45.7	19.1
Hawaiian Independent Refinery Inc.				
Ewa Beach, Hi.	ref. gas-LPG	Claus	14.0	14.0
Ewa Beach, Hi.	ref. gas-LPG	Claus	5.1	0
Hill Petroleum Co.				
Houston, Tex.	ref. gas	Claus	165.0	30.0
Hunt Refining Co.				
Tuscaloosa, Ala.	ref. gas	Claus	80.0	30.0
Koch Hydrocarbon Co.				
McKenzie County, ND	nat. gas	....	187.0	100.0
Harmony, Miss.	nat. gas	....	10.0	2.0
Koch Refining Co.				
Corpus Christi, Tex.	ref. gas	....	50.0	7.0
St. Paul, Minn.	ref. gas	....	425.0	400.0
LaGloria Oil & Gas Co.				
Tyler, Tex.	ref. gas	3 bed Claus	9.9	3.7
Louisiana Land & Exploration Co.				
Saraland, Ala.	refinery	Claus-Scot	50.0	0
Lyondell Petrochemical Co.				
Houston, Tex.	ref. gas	Claus	350.0	....
Mapco Petroleum Inc.				
Memphis, Tenn.	ref. gas	Claus-Scot	43.0	14.0
Marathon Oil Co.				
Detroit, Mich.	refinery	Claus	81.3	30.7
Eddy County, NM	nat. gas	3 bed Claus	25.4	8.9
Garyville, La.	refinery	Claus	457.2	195.6
Park County, Wyo.	nat. gas	3 bed Claus	4.7	4.0
Pecos County, Tex.	nat. gas	3 bed Claus	50.0	4.3
Robinson, Ill.	refinery	Claus	40.6	28.2
Mobil Oil Corp.				
Beaumont, Tex.	ref. gas	Claus	100.0	....
Ferndale, Wash.	ref. gas	Claus	19.5	....
Joliet, Ill.	ref. gas	Claus	315.0	....
Paulsboro, NJ	ref. gas	Claus	135.0	....
Torrance, Cal.	ref. gas	Claus	200.0	....
Montana Sulfur & Chemical Co.				
East Billings, Mont.	ref. gas	Claus	225.0	100.0
Murphy Oil USA Inc.				
Meraux, La.	ref. gas	Claus-Scot	35.0	14.0
Superior, Wis.	ref. gas	Claus	14.0	4.0
Newhall Refining Cl				
Newhall, Cal.	refinery	....	7.5	7.0
Oxy NGL Inc.				
Lignite, ND	nat. gas	....	14.0	4.5
Milnesand, NM	nat. gas	....	23.0	9.6
Myrtle Springs, Tex.	nat. gas	....	304.0	155.5
Welch, Tex.	nat. gas	....	1.5	0.5
West Seminole, Tex.	nat. gas	....	10.0	2.8
Pennzoil Products Co.				
Shreveport, La.	ref. gas	Claus	11.7	2.2
Phillips 66 Co.				
Andrews, Tex.	nat. gas	Claus	18.0	....
Birthright, Tex.	nat. gas	Claus	30.5	....
Borger, Tex.	refinery	Claus	240.0	....
Chatom, Ala.	nat. gas	Claus	193.0	....
Crane, Tex.	nat. gas	Claus	88.0	....
Eunice, NM	nat. gas	Claus	64.0	....
Fullerton, Tex.	nat. gas	Claus	61.0	....
Goldsmith, Tex.	nat. gas	Claus	145.0	....
Lee, NM	nat. gas	Claus	62.0	....
Sweeny, Tex.	refinery	Claus	275.0	....
Rock Island Refining Corp.				
Indianapolis, Ind.	ref. gas	Claus	20.3	3.0
Shell Oil Co.				
Anacortes, Wash.	ref. gas	Claus-Scot	20.0	....
Deer Park, Tex.	ref. gas	Claus-Scot	410.0	....
Martinez, Cal.	ref. gas	Claus-Scot Stretford	225.0	....
Norco, La.	ref. gas	Claus-Scot	45.0	....
Wilmington, Cal.	ref. gas	Claus-Scot	200.0	....
Wood River, Ill.	ref. gas	Claus-Scot	300.0	....
Shell Western E&P Inc.				
Bryans Mill, Tex.	nat. gas	Claus	175.0	....
Clark Avenue, Cal.	nat. gas	Claus-Scot	4.0	....
Denver Unit, Tex.	nat. gas	Claus	4.0	....
Frederic 10, Mich.	nat. gas	Claus	20.0	....
Goodwater, Miss.	nat. gas	Claus	50.0	....
Manistee County, Mich.	nat. gas	Claus	25.0	....
Thomasville, Miss.	nat. gas	Claus	1,245.0	....
Sid Richardson Carbon & Gasoline Co.				
Winkler County, Tex.	nat. gas	....	20.0	8.8
Smackover-Shell Ltd.				
Henderson County, Tex.	nat. gas	Claus-Scot	660.0	....
Standard Oil Co.				
Lima, Oh.	ref. gas	Claus	40.0	....
Toledo, Oh.	ref. gas	Claus-Scot	112.0	....
Tenneco Oil Co.				
Chalmette, La.	ref. gas	Claus	366.0	181.0
Texaco Inc.				
Anacortes, Wash.	ref. gas	Claus	51.0	....
Bakersfield, Cal.	ref. gas	Claus	19.0	....
Convent, La.	refinery	Claus	660.0	....
Delaware City, Del.	ref. gas	Claus	427.0	....
El Dorado, Kan.	ref. gas	Claus	178.0	....
Franklin County, Tex.li	nat. gas	Claus	219.0	50.0
Freestone County (Aker), Tex.	nat. gas	Claus	181.0	85.0
Freestone County (Teas), Tex.	nat. gas	Claus	138.0	90.0
Port Arthur, Tex.	ref. gas	Claus	238.0	....
Wilmington, Cal.	ref. gas	Claus	238.0	....
Texas Oil & Gas Corp.				
Coyanosa, Tex.	nat. gas	Claus	25.0	3.6
Pittsburg, Tex.	nat. gas	Claus	100.0	57.7
Teague, Tex.	nat. gas	Claus	10.0	5.0
Tosco				
Martinez, Cal.	ref. gas	Claus-Scot	180.0	115.0
Total Petroleum Inc.				
Alma, Mich.	ref. gas	Claus	13.2	12.4
Ardmore, Ok.	ref. gas	Claus	18.3	4.5
Arkansas City, Kans.	ref. gas	Claus	11.2	7.6
Denver, Colo.	ref. gas	Claus	6.1	1.5
Trans-Jeff Chemical Corp.				
Tilden, Tex.-No. 1	acid gas	Chance Claus	19.8	....
Tilden, Tex.-No. 2	acid gas	Chance Claus	74.9	27.0
Union Pacific Resources				
Wilmington, Cal.	crude oil	Claus	132.0	112.0
Unocal Corp.				
Lemont, Ill.	ref. gas	Claus Bevon Stretford	300.0	....
Lemont, Ill.	ref. gas	Claus	100.0	....
Nederland, Tex.	ref. gas	Claus	17.0	....
Rodeo, Cal.	ref. gas	Claus Stretford	350.0	....
Santa Maria, Cal.	ref. gas	Claus Unisulf	139.0	....
Wilmington, Cal.	ref. gas	Claus Stretford	200.0	....
Valero Refining and Marketing Co.				
Corpus Christi, Tex.	ref. gas	Claus	310.0	250.0
Warren Petroleum Co.				
Como, Hopkins County, Tex.	nat. gas	Claus	75.0	....
Fashing, Atascosa County, Tex.	nat. gas	Claus	36.0	....
Little Knife, Billings County, ND	nat. gas	Claus	125.0	....
Monument, Lea County, NM	nat. gas	Claus	32.0	....
Sand Hills, Crane County, Tex.	nat. gas	Claus	52.0	....
VENEZUELA				
Corpoven				
El Palito, Carabobo	refinery	Claus	36.0	15.4
Lagoven				
Amuay, Falcon	refinery	Claus	600.0	225.4
Maraven				
Cardon, Falcon	refinery	Claus	94.0	20.0



Annual Petrochemical Report

About this issue. . .

Petrochemical producers are enjoying a period of increased profitability resulting from strong demand for basic olefins and olefins derivatives. That demand caused a slight increase in worldwide ethylene capacity, and several announcements for even more capacity additions. Most of the increase was by modernization programs that incrementally increase capacity of existing facilities. Some of the announced projects, however, are for world-scale plants. One way to modernize an ethylene plant is to add advanced control technology. Another article in this special section shows how and where advanced controls can be profitably applied to ethylene plant process units.

Balanced petrochemical industry enjoys healthy profit potential

Richard A. Corbett
Refining/Petrochemical Editor

Profitability is the best it has been in several years for worldwide olefins and olefins-derivatives producers. That's because capacity and demand for those petrochemicals have come close to balanced.

That near balance has also caused olefins and derivatives prices to firm. With feedstock prices remaining low, profits are up.

Capacity excesses that existed as little as 3 years ago have been rationalized, and demand has strengthened.

Improved economic conditions worldwide, partly created by low crude oil prices, have spurred growth in petrochemical demand. And conservative moves by the petrochemical industry have allowed capacity and demand to come into better balance than that of the decade of the 1970s. Plants worldwide are presently operating in excess of 90% utilization.

Ethylene capacity grew some last year, but only enough to keep pace with demand increases. There is some fear that this period of good profits might spur another round of heavy ethylene capacity increases, as apparent growth potential during the 1970s did.

But the likelihood of that is tempered somewhat because circumstances are different now. During the 1970s, worldwide demand growth for ethylene was running at 10-15%/year. The result was heavy investment in producing facilities to meet an apparenty never-ending growth pattern.

Ethylene demand forecasts now show demand growing in step with world economic growth, at less than 5%/year. Although a few companies are contemplating some large capacity additions, that demand growth potential is not likely to spur too many massive capacity increases that would quickly result in overcapacity. Forecast demand growth won't support it, and the excesses of the 1970s that plagued the industry during the early 1980s are still fresh in the minds of producers.

Most of the ethylene capacity increases that occurred last year were not additions of world-scale, grassroots facilities. Rather, the increases resulted from improvements to existing facilities and higher on-stream factors—so called capacity creep.

Control modernization is one of the methods available to gain some incremental capacity and boost profitability in an existing plant. The application of advanced control technology to various parts of an ethylene-production facility is the topic of an article contained in this special section.

The driving force behind basic olefins (ethylene and propylene) demand is healthy demand for olefins derivatives. Demand for high and low density polyethylene (HDPE and LDPE), ethylene oxide and ethylene glycol, vinyl chloride monomer (VCM), polyvinyl chloride (PVC), styrene monomer, and polypropylene is strong worldwide. Strong demand for olefins derivatives has fostered several projects for upgrading and increasing capacity of derivatives-producing facilities, as well as some notable projects to increase ethylene capacity.

U. S. ethylene. U. S. ethylene producers have cut excess capacity from the high of about 18.2 million metric tons/year in 1981 to 16.985 million metric tons as of June 1, 1988 (Table 2). Present capacity is now in much better balance with current demand at about 16 million metric tons, only slightly higher than 1987.

Capacity and demand had been grossly out of balance until 1986 when demand began to catch up with existing capacity (Fig. 1). Profitability during the period of excess was naturally poor for producers.

The U. S. ethylene market has matured as a result of maturation of U. S. ethylene-derivatives markets, and future growth in demand is expected to track closely with growth in gross national product, at about 3-4%/year vs. the 10-15% annual demand growth experienced during the 1970s.

Export demand for ethylene is currently healthy, with some good margin export opportunities available, according to Earl H. Armstrong of DeWitt & Co. Inc., Houston. But capacity excesses and planned expansions elsewhere in the world could prevent domestic demand from increasing appreciably above 3-4%/year. There is little if any ethylene exported directly. It is exported as major derivatives: HDPE, LDPE, ethylene oxide, ethylene glycol, and ethylene dichloride.

Exports of HDPE and LDPE combined ran at about 800,000 metric tons, or 10% of the 17.7 metric tons produced in 1987, according to Armstrong. This is equivalent to about 862,000 metric tons of ethylene.

HDPE accounted for about 408,000 metric tons of ethylene equivalent and LDPE about 454,000 metric tons of ethylene equivalent. Both export levels are down from peaks of 544,000 metric tons of ethylene equivalent for both HDPE and LDPE during the early 1980s as a result of capacity increases in the Far East, according to Armstrong.

For ethylene oxide and ethylene glycol, exports ran at about 217,000 metric tons of ethylene equivalent in 1987. This is down from about 250,000 metric tons of ethylene equivalent exported in 1983-1984, according to Armstrong.

Most of the decline is attributed to increased ethylene glycol and oxide capacity that came on stream in Japan

Fig. 1

U.S. Ethylene capacity, demand reach balance

Fig. 2

Good growth expected for olefins derivatives

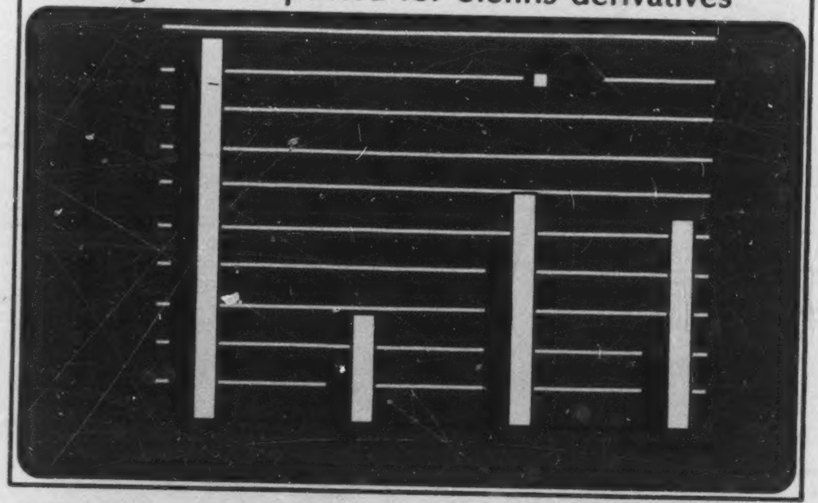


Table 1

Installed ethylene capacity: 1988*

Company	Location	Capacity, 1,000 metric tons/year	Feedstock†	Coproducts	Capacity, 1,000 metric tons/year§
U.S.					
Allied-Signal Inc. (with Union Texas Petroleum)	Geismar, La.	325	E,P	Propylene	21
				Butadiene	16
Amoco Chemicals Co.	Chocolate Bayou, Tex.	975	E,P,N	Propylene	390
				Butadiene	91
				Aromatics	85
B.F. Goodrich	Calvert City, Ky.	136	P	Propylene	90
Chevron Chemical Co.	Port Arthur, Tex.	386	NGL, R	Propylene	204
				Butadiene	22
	Baytown, Tex.	545	N, NGL, R	Propylene	295
				Butadiene	190
Cain Chemical Inc.	Corpus Christi, Tex.	700	LPG,N,G, Toluene	Propylene	275
				Butadiene	95
				Aromatics	250
	Alvin, Tex.	485	LPG,N,G, Toluene, Drip oil	Propylene	305
				Butadiene	60
				Aromatics	340
Dow Chemical	Freeport, Tex.	1,136	E,P,B,N	Propylene	250
				Butadiene	39
	Plaquemine, La.	682	E,P,B,N	Propylene	75
Du Pont Petrochemical	Orange, Tex.	375	E,P	Propylene	–
				C_4	–
El Paso Products Co.	Odessa, Tex.	230	E	Propylene	100
Exxon Chemical U.S.A.	Baton Rouge, La.	590	E,P N,G	Propylene	400
				Butadiene	–
				Aromatics	–
	Baytown, Tex.	590	N,G	Propylene	408
				Butadiene	113
Fina Oil & Chem.	Groves, Tex.	9	R	Propylene	30
Lyondell Chemical Co.	Channelview, Tex.	1,270	E,P,N,G	Propylene	725
				Butadiene	200
				Py gas	1,180
				Aromatics	220
				Fuel oils	670
Mobil Chemical Co.	Beaumont, Tex.	499	NGL,N	Propylene	136
				Butadiene	27
				Aromatics	35
	Houston, Tex.	227	NGL,R	Propylene	82
Occidental Chemical Corp.	Lake Charles, La.	227	E,P	Propylene	82
Phillips 66 Co.	Sweeney, Tex.	1,043	E,P	Propylene	170
				Butadiene	44
Shell Chemical	Deer Park, Tex.	812	NGL,R	Propylene	485
				Butadiene	113
	Norco, La.	1,016	NGL,R	Propylene	635
				Butadiene	226
Sun-Olin Chemical Co.	Claymont, Del.	109	R	–	–
Sun Refining & Marketing Co.	Marcus Hook, Pa.	86	R	–	–
Texaco	Port Arthur, Tex.	475	NGL,N,G	Propylene	238
				Butadiene	51
				Py gas & Aromatics	224
				Fuel oils	111
	Port Neches, Tex.	160	E,P	Propylene	136
Texas Eastman Co.	Longview, Tex.	650	E,P	Propylene	300
				Aromatics & Py gas	67
				Fuel oils	6
Union Carbide	Seadrift, Tex.	562	E,P	Propylene	46
				Butadiene	–
				Aromatics	–
	Taft, La.	500	LPG,N	Propylene	193
				Butadiene	–
				Aromatics	–
	Texas City, Tex.	702	LPG,N	Propylene	136
				Butadiene	–
				Aromatics	–
Quantum Chemical Corp.—USI Div.	Deer Park, Tex.	180	E	–	–
	Morris, Ill	455	E,P,B	Propylene	110
				Butadiene	15
				Py gas	25
	Clinton, Iowa	365	E,P	Propylene	14
				Butadiene	17
				Py gas	24
				Fuels	124
	Tuscola, Ill.	182	E,P	–	–
Vista Chemical Co.	West Lake, La.	301	E	Propylene	8
				Butadiene	15
				Aromatics	8
U.S. total		**16,985**			
ALGERIA					
Sonatrach	Arzew	364	LNG	–	–
ARGENTINA					
Duperial S.A.I.C.	San Lorenzo	15	N	Propylene	6
				Py gas	6
				Fuel oils	6
Ipako	Ensenada	15	R	–	–
PASA Petroquimia Arg.	Pto. Gral. San Martin	24	P	–	–
Petroquimica Bahia Blanca	Bahia Blanca	201	E	C_3	6
				C_4	9
				Py gas	7
Argentina total		**255**			
AUSTRALIA					
Altona Petrochem. Co. Ltd.	Altona, Victoria	170	E,G	Propylene	50
				Butadiene	17
ICI Australia	Botany, NSW	250	N,LPG	Propylene	95
				Butadiene	23
				Fuel oils	16
				Py gas	70
Australia total		**420**			
AUSTRIA					
OMV A.G.	Schwechat	320	B,N,G,R	Propylene	160
				Butadiene	50
BELGIUM					
Petrochem S.A.	Antwerp	520	N	Propylene	230
				Butadiene	65
				Aromatics	230
				Fuel oils	85
				Py gas	150
BOLIVIA					
Yacimientos Petroliferos Bolivianos	La Paz	230	E,P	Propylene	56
				Py gas	22
BRAZIL					
Brasiliera de Estireno	Cubatao	5	EtOH	–	–
Industrias Quimicas Electro Cloro	Santo Andre	11	EtOH	–	–
Copene Petroquimica	Camaracari-Bahia	460	N,G	Propylene	272
				Butadiene	79
				Py gas	420
				Aromatics	200
Copesul	Triunfo RS	490	N	Propylene	260
				Butadiene	84
				Py gas	189
				Aromatics	263
				Fuel oils	78
Coperbo	Cabo	36	EtOH	–	–
Petroquimica Uniao S.A.	Santo Andre	360	N	Propylene	204
				Py gas	103
				Butadiene	50
				Aromatics	312
Salgema Industrias Quimicas S.A.	Maceio-Alagoas	100	EtOH	–	–
Union Carbide	Cubatao	40	EtOH	–	–
Brazil total		**1,502**			
CANADA					
Alberta Gas Ethylene Co. Ltd.	Joffre, Alta.	1,408	E	Propylene	40
				Butadiene	59
				Aromatics & Py gas	58
Dow Chemical	Sarnia, Ont.	50	P,B,R	Propylene	–
Imperial (Esso Chemical)	Sarnia, Ont.	220	NGL	Propylene	40
				Butadiene	8
				Py gas	25
Petromont	Varnenes, Que.	225	N	Propylene	–
Polysar Ltd.	Corunna (Sarnia), Ont.	455	E,N,G	Propylene	330
				Butadiene	91
				Aromatics	125
Canada total		**2,358**			
CHILE					
Petrox S.A.	Talcahuano	60	N	Py gas	86
				Fuel oils	9
COLOMBIA					
Empresa Colombiana	Barrancabermeja	100	E,R		
Poliolefinas Colombianas	Barrancabermeja	100	E,R	Py gas	2
				Py gas	1
Colombia total		**200**			
FINLAND					
Neste Oy	Porvoo	230	N,G, R,NGL	Propylene	170
				Butadiene	20
FRANCE					
Atochem	Lavera	250	E,N	Propylene	740
				Butadiene	50
				Butadiene	50
				Aromatics	50
	Feyzin	115	N, LPG	Propylene	60
				Butadiene	30
				Aromatics	30
	Gonfreville	385	N, LPG	Propylene	200
				Butadiene	60
	Lacq	70	E	–	–

(continued)

Installed ethylene capacity: 1988*

Table 1 (continued)

Company	Location	Capacity, 1,000 metric tons/year	Feedstock†	Coproducts	Capacity, 1,000 metric tons/year§
BP Chimie	Lavera	240	LPG,N	Propylene Butadiene	155 50
CdF Chimie	Charling & Lillebonner	420	N,G	Propylene Butadiene Py gas Aromatics Fuel oils	220 130 55 360 260
Copenor	Dunkerque	275	N,G,LPG	Propylene Butadiene Py gas Aromatics Fuel oils	120 75 40 170 175
Shell Chimie	Berre	380	N,G,LH		
Esso Chimie	Notre Dame de Gravenchon	300	N,R	Propylene Butadiene Py gas	220 70 310
France total		**2,435**			
GERMANY					
BASF A.G.	Ludwigshafen	450	N	Propylene C_4 Py gas	240 150 360
Deutsche Marathon	Burghausen	280	N,R	Propylene Butadiene Fuel oil	130 90 2
Deutsche Texaco A.G.	Heide	80	N	Propylene C_4	55 28
Erdolchemie G.m.b.H.	Worringen	740	N	Propylene Butadiene Aromatics	520 245 200
Esso Chemie G.m.b.H	Cologne	450	N	Propylene C_4	240 38
Hüls AG	Marl	50	LPG	–	–
Rheinische Olefinwerke	Wesseling	650	N,G,P	Propylene Butadiene Py gas	300 150 520
Union Rheinische Braun-Kohlen Krafstoff A.G.	Wesseling	440	N,G,R LH	Propylene C_4 Py gas Fuel oils	260 150 595 165
Ruhr Oel A.G.	Gelsenkirchen	400	N, LPG	Propylene Py gas Aromatics	245 360 90
	Munchmunster	200	N,LPG	Propylene Py gas	130 150
Chemische Werke Hüls	Marl	50	LPG	–	–
Germany total		**3,790**			
HUNGARY					
Tiszai Vegyi Kombinat	Leninvavos	250	N	Propylene C_4 Py gas	125 80 200
GREECE					
EKO Chemicals Co.	Thessaloniki	15	N	Py gas	10
INDIA					
Alkali & Chemical Corp.	Rishra, W. Bengal	12	EtOH	–	–
Chemicals & Plastics India	Mettudam	19	EtOH	–	–
McDowell & Co.	Visakhapatnam	3	EtOH	–	–
India Petrochem Corp.	Baroda	130	N	Propylene Butadiene Py gas Aromatics	81 22 29 20
National Organic Chemicals Industries Ltd.	Thane, Bombay	63	N	Propylene Butadiene	37 7
Polychem Ltd.	Bombay	2	EtOH	–	–
	Nira	4	EtOH	–	–
Union Carbide India Ltd.	Bombay	22	N	Propylene Benzene Aromatics Fuel oils	6 3 6 6
Synthetics & Chemicals Ltd.		4	EtOH	–	–
India total		**256**			
IRAN					
Abadan Petrochemical	Abadan	26	R	Propylene	15
ISRAEL					
Oil Ref. Ltd.	Haifa Bay	130	N,R,LPG	–	–
ITALY					
Enichem	Gela	310	E,N	Propylene Butadiene Py gas Aromatics Fuel oils	160 40 280 150 55
	Priolo	215	N	Propylene	150
	Bindisi	130	N	Propylene Butadiene	85 120
	Porto Tores	240	N	Propylene Butadiene	121 50
ICAM	Priolo	600	N,G	Propylene	350
Montedipe	Porto Marghera	350	N	Propylene	180
Italy total		**1,845**			
JAPAN					
Idemitsu Petrochem Co. Inc.	Tokuyama	380	N	Propylene	220
Maruzen Petrochem Co. Inc.	Goi	373	N	Propylene Butadiene Aromatics	220 55 240
Mitsubishi Petrochemical Co. Inc.	Kashima	325	N,LPG	–	–
	Yokkaichi	211	N,LPG	–	–
Mizushima-Ethylene	Mizushima	360	N,LPG	Propylene Py gas Fuel oils	216 250 50
Nippon Petrochemicals	Kawasaki	190	N,LPG	Propylene Butadiene	148 50
Osaka Petrochemicals Inds.	Osaka	300	N,B	Propylene Aromatics Butadiene Py gas	200 60 50 300
Sanyo Ethylene Co.	Mizushima	390	N	Propylene	254
Shin Daikyowa Petrochemical Co.	Yokkaichi	300	N	Propylene Butadiene Py gas Aromatics	156 44 220 124
Showa Denko, K.K.	Ohita	320	N,LPG	Propylene Butadiene Py gas Fuel oils	170 45 160 67
Sumitomo Chem. Co. Ltd.	Chiba	345	N,LPG	Propylene	252
	Nihama	139	N	Propylene	123
Tonen Petrochemical Co. Ltd.	Kawasaki	350	N,LPG	Propylene Butadiene	224 105
Ukishima Petrochem Co. Ltd.	Ukishima & Chiba	312	N	Propylene	417
Japan total		**4,295**			
KOREA					
Daelim Industrial	Yeochun	350	N,G,LPG	Propylene Py gas Aromatics	187 320 80
Yukong Ltd. (formerly Korea Oil)	Ulsan	155	N	Propylene Butadiene Aromatics Fuel oils	81 24 78 18
Korea total		**505**		Py gas	128
MEXICO					
Petroleos Mexicanos	Cangrejera	500		Propylene	27
	Pajaritos	209	E		
	Poza Rica	182	E	Propylene	9
	Reynosa	27	LH		
	Ciudad Madero	14	R		
Mexico total		**932**			
THE NETHERLANDS					
Dow Chemical Europe	Terneuzen	960	N	Propylene Benzene Butadiene	450 600 150
DSM	Limburg	850	N,G,LPG	Propylene Butadiene	470 110
Shell Nederland Chemie BV	Moerdijk	515	N,G,LPG	Propylene Butadiene	300 115
Netherlands total		**2,325**		Py gas	525
NORWAY					
I/S Noretyl	Rafnes	390	NGL	Propylene	70
PORTUGAL					
Companhia Nacional de Peroquimica	Sines	300	LPG,N	Propylene Butadiene Py gas Fuel oils	150 40 70 14
PUERTO RICO					
Union Carbide Caribe Inc.	Ponce	413	N,LPG	Propylene	227
QATAR					
Qatar Petrochemical	Umm Said	280	E	Propylene	5
SAUDI ARABIA					
Saudi Petrochemical Co.	Al-Jubail	656	E	–	–
Arabian Petrochemical Co.	Al-Jubail	500	E	–	–

(continued)

Table 1 (continued)

Installed ethylene capacity: 1988*

Company	Location	Capacity, 1,000 metric tons/year	Feed-stock†	Coproducts	Capacity, 1,000 metric tons/year§
Saudi Yanbu Petrochem. Co.	Yanbu	455	E	–	–
Saudi Arabia total		**1,611**			
SINGAPORE					
Singapore Petro-Chemical	Singapore	300	LPG,N	Propylene	–
SOUTH AFRICA					
Sasol Ltd.	Sasolburg	220	Syn. gas		
SPAIN					
Dow	Tarragona	350	N	Propylene	130
				Butadiene	50
				Py gas	300
Repsol Petroleo S.A.	Puertollano	210	N,R	Propylene	90
	Tarragona	335	LPG,N	Propylene	165
Industrias Quimicas Asociadas S.A.	Tarragona	71	N	Propylene	36
				Butadiene	7.5
				Aromatics	40
Spain total		**966**			
SWEDEN					
Statoil Petro-chemie A/B	Stenungsund	355	N,P	Propylene	170
SWITZERLAND					
Lonza, A.G.	Visp	30	N,LPG	Acetylene	—
SYRIA					
General Fertilizer Co.	Katteneh	250	E	–	–
TAIWAN					
Chinese Petro. Corp.	Koahsiung	899	N,G	Propylene	478
				Butadiene	128
				Py gas	350
				Aromatics	615
				Fuel oils	334
China Petrochemical Development Corp.	Toufen	54	E	–	–
Taiwan total		**953**			
TURKEY					
Yarpet Yarimca Petrokimya A.S.	Izmit	55	N	Propylene	40
				C_4	26
				Py gas	58
				Fuel oils	8
	Izmir	300	N	Propylene	88
				C_4	80
				Py gas	250
Turkey total		**355**			
UNITED KINGDOM					
BP Chemicals	Baglan Bay	340	N	Propylene	200
				Butadiene	60
	Grangemouth	250		Propylene	180
				Butadiene	48
ICI/BP	Wilton	750	N,P	Propylene	350
				Butadiene	90
Exxon Chemical Olefins Inc.	Fawley	105	N,G	Propylene	100
				Butadiene	80
	Fife	500	E		
U.K. total		**1,945**			
VENEZUELA					
Pequiven	El Tablazo	150	E,P	Propylene	35
WORLD TOTAL					
*(As of June 1, 1988)		**48,766**			

*Key: E = ethane, P = propane, B = butane, R = refinery streams, N = naphtha, G = gas oil, LH = light hydrocarbons, NGL = natural gas liquids (ethane, propane, butane), LPG = liquefied petroleum gas (propane, butane), EtOH = ethanol

§ Coproduct production is only estimated or design quality. Actual production can vary widely, depending on feedstock slate, severity, etc.

and Taiwan. Ethylene dichloride exports rebounded from a 1986 level of 80,000 metric tons of ethylene equivalent to about 127,000 metric tons of ethylene equivalent in 1987, according to Armstrong. The 1986 level resulted from added capacity in China.

Because exports are not likely to provide appreciable increases in U.S. ethylene demand over the 3-4%/year expected, the industry has been hesitant to begin large-scale capacity expansions. Utilizing available capacity creep may be enough to meet the expected demand. Last year's capacity increases by U.S. companies (Table 1) is evidence of the incremental increases made.

Far East. A tight ethylene-supply situation also exists in the Far East, with plants running at full capacity, and in some cases above nameplate. The big players in ethylene in the Far East, for the most part, are Japan, Taiwan, and South Korea.

In Japan, the ethylene market has matured as it has in the U.S. In Taiwan and South Korea, however, ethylene capacity in both countries is not adequate to meet domestic demand. Capacity in the region was 6.729 million metric tons/year as of June 1, 1988.

Since 1983, Japan has experienced ethylene capacity declines from more than 5.6 million metric tons/year to 4.295 million metric tons/year as of June 1, 1988. In contrast, Taiwan and South Korea gained capacity since 1983 and maintained capacity at 505,000 metric tons/year for South Korea and 953,000 metric tons/year for Taiwan as of June 1. Japan accounted for about 75% of the region's ethylene capacity in 1983, according to Tosaku Nakazawa of Idemitsu Petrochemical Co. But that is expected to decline to about 45% by 1992, as a result of inceases in capacity in Taiwan, South Korea, and China.

As a result, newly constructed capacity is not expected in Japan, according to Nakazawa. There are currently about 600,000 metric tons/year of idled capacity in Japan that could be restarted. Of those idled plants, about 240,000 metric tons have already been announced to restart during 1988. The remaining 360,000 metric tons/year will likely restart during the next couple of years. That's because the projected 3.8% annual growth in Japanese ethylene demand could likely result in a capacity/demand imbalance by 1991.

Some of that short capacity will likely be made up by imports from Taiwan and South Korea.

Both South Korea and Taiwan have been experiencing shortages of ethylene supplies resulting from strong demand during the past 2 or 3 years, according to Nakazawa. South Korea has been meeting the shortages with imports from Japan, at a current level of about 150,000 metric tons/year.

Taiwan has had to cut back derivatives production as a result of its ethylene shortage. But a planned import terminal to be completed by 1989 will allow ethylene imports of about 100,000-150,000 metric tons/year from Japan. Both countries have announced or planned major ethylene capacity expansions to meet their demands, with increased domestic ethylene capacity to be completed by 1992. About 1.4 million metric tons/year of new capacity is expected to be added in the two countries.

Western Europe. Ethylene capacity in Western Europe has increased to about 15.4 million metric tons/year because of improved demand in the region. This is compared to production of about 14 million metric tons/year. Plants in the region are operating at about 96% utilization, similar to the other regions of the world.

Demand in the region is expected to increase by 2.3%/year through 1991, according to Peter Jordan, DeWitt & Co. Inc., London. To meet that demand, it is expected that about 700,000 metric tons/year of additional capacity will be added by 1991, according to Jordan. Most, if not all, of the needed capacity will be from de-

Table 2

Ethylene capacity by country

Area	1986	1987	1988
	1,000 metric tons/year		
North America			
U.S.	16,778	16,820	16,985
Canada	2,242	2,242	2,358
Total	**19,020**	**19,020**	**19,343**
Latin America			
Argentina	253	254	255
Bolivia	230	230	230
Brazil	1,428	1,461	1,502
Chile	60	60	60
Colombia	115	115	200
Mexico	932	932	932
Puerto Rico	413	413	413
Venezuela	150	150	150
Total	**3,581**	**3,615**	**3,742**
Western Europe			
Austria	285	320	320
Belgium	520	520	520
Finland	200	200	230
France	2,415	2,400	2,435
West Germany	3,660	3,790	3,790
Greece	15	15	15
Italy	1,485	1,485	1,845
The Netherlands	2,260	2,285	2,325
Norway	300	390	390
Portugal	300	300	300
Spain	956	966	966
Sweden	365	365	355
Switzerland	30	230	30
U.K.	1,995	1,845	1,945
Total	**14,786**	**14,911**	**15,466**
Asia-Pacific			
Australna	420	420	420
India	252	256	256
Japan	5,418	5,357	4,295
Korea	505	505	505
Singapore	300	300	300
Taiwan	953	953	953
Total	**7,848**	**7,791**	**6,729**
Other			
Algeria	364	364	364
Hungary	—	—	250
Iran	26	26	26
Israel	130	130	130
Qatar	280	280	280
Saudi Arabia	1,611	1,611	1,611
South Africa	150	150	220
Syria	—	—	250
Turkey	355	355	355
Total	**2,916**	**2,916**	**3,486**
World total	**48,151**	**48,295**	**48,766**

* As of June 1, 1988.

bottlenecking and capacity creep. Because of the availability of more incremental capacity when demand fosters it, capacity can be considered a variable, according to Jordan. Therefore, there will be some spare capacity above nameplate capacities. And there appears to be sufficient capacity in the region to handle ethylene demand increases of up to 3%/year to 1991.

Olefins derivatives. Olefins derivatives were a major contributor to the petrochemical industry's performance last year. Evidence of that contribution is indicated by the large increase in U.S. production of many of the major ethylene and propylene derivatives over 1986 levels.

Polypropylene scored a 15% increase in U.S. production to about 3.1 million metric tons in 1987 from about 2.7 metric tons in 1986, according to U.S. International Trade Commission data. High-density polyethylene scored a 12% increase to 3.7 metric tons from 3.3 metric tons.

Other derivatives showing 5% or more increases were polyvinyl chloride, up 9% to more than 3.6 million metric tons in 1987 from 3.3 metric tons in 1986, and low-density polyethylene up 5% to about 4.2 million metric tons from 4.0 metric tons.

World capacity to produce some of the major ethylene and propylene derivatives is closely balanced with demand, leading to tight supplies in some areas of the world. OGJ estimates from its worldwide petrochemical survey show LDPE capacity leading the list at about 17.4 million metric tons/year (Table 3). Note that linear low-density polyethylene (LLDPE) and copolymers are included with the LDPE capacity figures.

Polyvinyl chloride capacity shows the second largest derivative capacity at about 12.6 million metric tons/year. The bulk of the world capacity resides in North America (3.95 million metric tons/year) and Western Europe (4.1 million metric tons/year).

Ethylbenzene capacity listed in Table 3 at about 8.7 million metric tons/year does not include capacity from catalytic reformers. And cumene capacity at about 3.6 million metric tons/year does not include all cumene capacity from oil refineries.

Strong demand for the olefins derivatives, and the need for some regions of the world to become self sufficient in supply of them, has resulted in plans for some fairly large capacity increases worldwide. Expected capacity increases for some of the major derivatives are shown in Fig. 2.

Polypropylene capacity is expected to increase by more than 46% by the end of 1991, according to W.C. Kuhlke, DeWitt & Co., Houston. That would add about 4.5 million metric tons/year to the estimated 10.1 million metric tons/year of existing worldwide capacity. By region, Europe will add about 1.7 million metric tons/year, Asia about 1.2 million metric tons/year, North America about 1.1 million metric tons/year, Latin America 590,000 metric tons, and Africa and the Middle East about 265,000 metric tons, according to Kuhlke. On a percentage basis, the largest increase in capacity is slated for Latin America at 57.0%, followed by Africa and the Middle East at 38.9%.

Western Europe and Asia will show smaller increases at 16.5% and 14.7%., with North America increasing by only 6.5%. Propylene demand growth for the various regions is expected to be 10-15%/year for Latin America, Africa, the Middle East, and Asia, according to Kuhlke. But demand growth in North America is only expected to be between 5% and 7%/year, and for Western Europe between 5% and 10%/year.

With these demand and capacity forecasts, Latin America, Africa, and the Middle East will cease to be importers of polypropylene. But Asian countries, except Japan, will still need imports. Excess capacity in the U.S. and Western Europe will meet the Asian demand, according to Kuhlke.

Far East demand for HDPE and LDPE will likely be met by existing capacity and announced capacity additions to about 1990, according to Armstrong. This is based on a 10%/year demand growth for HDPE and 5%/year for LDPE in the region.

Projects. The apparent boom in the petrochemical industry has spurred a number of projects worldwide for increased capacity of ethylene and olefins derivatives. In the U.S., Dow

Table 3

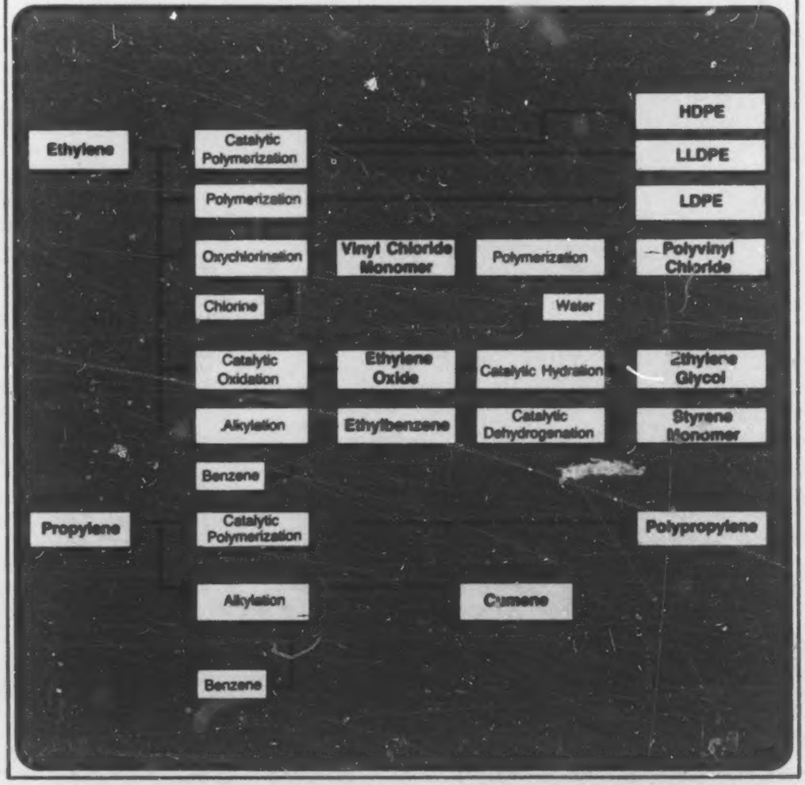
World derivatives capacity

Derivative	North America*	Latin America	Western Europe	Asia/Pacific	Other†	Total
	Capacity, 1,000 metric tons/year					
HDPE	4,360	550	1,960	1,440	650	9,600
LDPE§	5,950	1,650	6,150	2,200	1,450	17,400
Ethylbenzene•	4,600	400	2,820	850	—	8,720
Vinyl chloride monomer	4,455	650	750	2,940	975	9,645
Polyvinyl chloride	3,950	[illegible]	4,100	2,650	925	12,6[illegible]5
Styrene monomer	4,630	725	3,300	2,850	425	11,930
Polypropylene	3,330	250	4,140	2,100	250	10,070
Ethylene oxide	3,125	380	1,540	1,100	—	6,145
Ethylene glycol	2,930	360	1,420	1,000	575	6,285
Cumene¶	1,990	40	1,235	300	—	3,565

*U.S. and Canada
†Middle East, Africa, and reported East Europe
§Includes linear low density polyethylene
¶Does not include all cumene produced in oil refineries
•Does not include ethylbenzene from catalytic reforming
Source: OGJ annual Petrochemical Survey and OGJ estimates.

Fig. 3

Process routes to some olefins derivatives


Ethylene
Catalytic Polymerization
Polymerization
Oxychlorination
Chlorine
Catalytic Oxidation
Alkylation
Benzene
Vinyl Chloride Monomer
Ethylene Oxide
Ethylbenzene
Polymerization
Water
Catalytic Hydration
Catalytic Dehydrogenation
HDPE
LLDPE
LDPE
Polyvinyl Chloride
Ethylene Glycol
Styrene Monomer
Propylene
Catalytic Polymerization
Polypropylene
Alkylation
Cumene
Benzene

Chemical Co. plans to add 680,000 metric tons/year ethylene capacity to its facilities in Freeport, Tex. The $700 million project will bring the complex's total ethylene capacity to more than 1.8 million tons/year.

Union Carbide Corp. plans to add 544,000 metric tons/year in phases to its 1.1 million metric ton/year ethylene oxide plant at its Seabrook, Tex., facilities. The first phase, to be completed in 1989, will add 155,000 metric tons/year. A 363,000 metric ton/year ethylene dichloride plant is planned to be constructed for Occidental Chemical Corp. in Corpus Christi, Tex. Construction of the $40 million plant was expected to start in the second quarter of 1988.

Capacity expansions worth $600 million are also expected at Quantum Chemical Corp.'s Houston and Deer Park plants. Quantum will construct a 680,000 metric ton/year ethylene plant at Deer Park and a 91 million metric ton/year HDPE plant in Houston. Chevron Chemical Co. plans to spend $250 million for added olefins and low-density polyethylene capacity and debottlenecking at its Cedar Bayou, Tex., complex.

Mobil Chemical Co. plans to spend $300 million to expand polyethylene capacity at its Beaumont, Tex., complex, and Phillips 66 Co. will spend $300 million on an ethylene plant at Sweeny, Tex., and $100 million to expand polyethylene capacity at its Pasadena, Tex., plant.

Worldwide, Dow Chemical Iberica SA will build a $120 million, 150,000 metric ton/year linear low-density polyethylene plant at its Tarragona, Spain, complex. Lucky Petrochemical Co. has contracted for a 350,000 metric ton/year grassroots ethylene plant at Yeochon City, South Korea. The company also contracted to build a 300,000 metric ton/year vinyl chloride plant at Yeochon City.

BP Chemicals Ltd. will build a 125,000 metric ton/year linear low-density polyethylene plant at its Grangemouth, Scotland, complex. The plant will replace a 90,000 metric ton/year LDPE plant.

Exxon Chemical Co. will add about 120,000 metric tons/year capacity to its Meerhout, Belgium, polyethylene plant. The expansion is scheduled in three stages and will cost about $30 million. Royal Dutch/Shell Group has planned to construct a 120,000 metric ton/year polypropylene plant, to be completed in 1989, near Cologne, West Germany.

Petrofina SA and Neste Oy of Finland will invest nearly $620 million in a new company, Finaneste, which will build a 450,000 metric ton/year ethylene plant at Antwerp, Belgium. Petrofina will hold 65% and Neste Oy 35% of the company.

The new capacity and debottlenecking of existing units at the complex will boost Finaneste's ethylene capacity to 1 million metric tons/year by 1991. ▪

Worldwide
Catalyst
Report

First-time comprehensive list compiles world's petrochemical catalysts

Richard A. Corbett
Refining/Petrochemical Editor

To help sort out the many different catalysts used in the worldwide petrochemical industry, the Journal has compiled the first comprehensive list of catalysts and their specific applications by petrochemical products. This exclusive compilation is published as an extension to the compilation of worldwide refining catalysts that made its debut in the Journal in 1984, and has been repeated in years since.

The compilation is designed to list catalysts by their commercial designation or trade identification, the process the catalyst is used in, and to list certain features of a particular catalyst. It is hoped that the compilation will provide petrochemical producers with a single reference source for the wide array of products available from the world's catalyst manufacturers and suppliers.

The compilation differs from the refining catalyst compilation in that the catalysts are listed under the petrochemical products produced rather than by the processes in which the catalysts are used. This was done because there are a limited number of processes used to produce each of the products listed, and there are, in most cases, a limited number of catalysts available for the processes.

The compilation is the result of an extensive survey of the world's catalyst manufacturers and suppliers. Suppliers were asked to supply information on each of their catalysts for each product category presented.

Response to the survey was excellent, and it is believed most, if not all, of the world's petrochemical catalyst suppliers were contacted and responded.

Most of the suppliers listed in the compilation are familiar names to petrochemical producers. However, as a result of recent mergers, some new names are now on the scene. Some of these new names are discussed later.

Survey format. Major categories covered by the compilation are: olefins derivatives, aromatics production, aromatics derivatives, synthesis gas processes, and a general category that covers some processes not covered under the major categories. Products listed under the major petrochemical groups are generally limited to either

Table 1

Major catalytic petrochemical processes

Product	Process
Olefins derivatives	
High density polyethylene	Ziegler polymerization of ethylene
Linear low density polymerization	Ziegler polymerization of ethylene
Polypropylene	Ziegler-Natta polymerization of propylene
Ethylene oxide	Catalytic oxidation
Vinyl acetate	Catalytic oxidation of ethylene and acetic acid
Vinyl chloride	Oxychlorination of ethylene
Acrylonitrile	Ammoxidation of propylene
Acrylates	Esterification and carbonylation of acetylene or vapor-phase reaction of propylene with air
Acetaldehyde	Wacker process, oxidation of ethylene
Cumene	Alkylation of propylene and benzene
Aromatics derivatives	
Styrene	Catalytic dehydrogenation of ethylbenzene
Cyclohexane	Catalytic hydrogenation of benzene
Phenols	Cumene process
Terephthalic acid	Liquid phase oxidation, p-xylene
Maleic anhydride	Catalytic reaction of benzene and air
Other processes	
Xylene isomerization	Producer o- and p-xylenes from m-xylene
Hydrodealkylation	Converts toluene to benzene
Disproportionation	Converts toluene to benzene and xylenes
Synthesis gas processes	Steam reforming of off gases, hydrodesulfurization, chloride removal, nat. gas reforming, methanation, and synthesis

the first or second derivative of the group.

For instance, high density polyethylene and linear low density polyethylene are first derivatives of ethylene. Under aromatics derivatives, styrene monomer is listed as a second derivative of benzene and ethylene, which are first made into ethylbenzene that is catalytically dehydrogenated to form styrene. A third derivative would be polystyrene which is not listed.

For space reasons, the petrochemical products that are catalytically produced are also limited, for the most part, to those products whose annual U.S. production is more than 2.5 million metric tons annually.

Respondents to the survey were asked to provide as much of the information listed in the table as they felt necessary to describe their catalysts. Information not given in some of the columns means that the supplier chose not to respond with that specific piece of information.

There are a fair number of proprietary catalysts available for specific processes that are not commercially available except as part of the overall process license. A few of these made the list, but most respondents chose not to list any such proprietary catalysts.

The comments column was provided to allow suppliers to list any special features of a particular catalyst. This will allow some differentiation between the catalysts listed under a specific product category, although differentiation between catalyst types is not a major goal of the compilation.

Processes. Space does not allow a complete discussion of all of the petrochemical processes used to produce the petrochemical products listed in the compilation. The processes used to make the listed products take several intertwining routes that utilize the primary olefins and aromatics. Of course, most of the basic aromatics benzene, toluene, and xylenes, are produced in refinery catalyic reformers, (See OGJ, Oct. 5, 1987, pp. 42-46).

Also, there are several processes associated with aromatics production other than from refinery-based catalytic reforming, and processes associated with the production and purification of synthesis and off gases. Some of the processes used to produce the various listed petrochemical products are shown in Table 1.

Compilation details. Several abbreviations are used in the petrochemical catalyst compilation to provide as much information as possible in the allotted space. Many of the abbreviations are self explanatory.

Under the column headed "Form," solid catalysts are supplied in several shapes. Spherical catalysts are shown with the abbreviation, Sph., extrudites as Ext., cylindrical shapes as Cyl., granular catalysts as Gran., and those that are supplied as irregular particles as Irreg. Some catalysts are supplied as liquids, slurries, or etc. These are indicated without abbreviation.

The last column at the right of the table deserves further explanation. A check mark (√) in the column indicates that the catalyst is available for general sale to the industry. Any catalysts marked with an "L" are available only through licensing agreements with the licensor of the particular process in which the catalyst is used.

Companies. Recently, several companies have completed mergers or joint ventures, resulting in some new names in the compilation that may not yet be familiar to the industry.

This past spring, American Cyanamid Co. and Shell Chemical Co. formed a joint venture, limited partnership called Criterion Catalysts, headquartered in Houston. The new venture combines many of the Shell and Cyanamid refining and petrochemical catalyst efforts into the single company.

Criterion now supplies styrene and other petrochemical catalysts formerly supplied by both Shell and Cyanamid, in addition to a wide range of catalytic reforming, hydrotreating, and hydrocracking refining catalysts previously supplied by both companies.

Union Carbide Corp. and UOP Inc. recently completed a joint venture agreement that includes a number of both petrochemical and refining catalysts previously offered by both companies. The joint venture is called simply UOP, and will be headquartered in Des Plaines, Ill.

The catalyst operations of Kaiser Chemicals Division of Kaiser Aluminum & Chemical Corp., has been acquired by LaRoche Chemicals Inc. Headquarters remain in Baton Rouge, La.

Katalco Corp., Chicago, has changed its name since the last refining catalyst compilation to ICI Katalco. ICI Katalco is part of ICI Products Group, a business unit of ICI Americas Inc.

As a result of a recent merger, the Harshaw/Filtrol Partnership has been acquired by Engelhard Corp. The listings for Engelhard also list the catalysts formerly available from Harshaw/Filtrol. Offices for those catalysts remain in Pepperpoint, Ohio.

Refining readers will recognize many of the catalyst suppliers because they offer both refining and petrochemical catalysts. There are some suppliers that direct their offerings towards petrochemical catalysts only.

The Dutral Ausimont Group is a well known worldwide supplier of petrochemical catalysts and is part of Ausimont Compo n.v. Group, a division of Italy's Montedison Specialty Chemicals Division. PQ Corp., Valley Forge, Pa., is also well known to petrochemical producers. PQ recently formed a joint venture with Shell Chemical Co., called Zeolist Enterprises Inc., but Zeolist offers only refining catalysts.

We hope the efforts expended in compiling this list of petrochemical catalysts will prove valuable to our petrochemical and other processing readers. It is our intent to update the compilation in subsequent years.

We appreciate the efforts of all of the suppliers that responded to our survey.

OGJ Petrochemical Catalyst Compilation—1988

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
OLEFINS DERIVATIVES						
High-density polyethylene						
CROSFIELD CATALYSTS						
EP20	Phillips, USI, Unipol		SiO_2	Cr/SiO_2	—	✓
EP30	"		"	"		✓
EP118	"		"	"		✓
EP200	"		"	$Cr/Al/SiO_2$		✓
EP250	Phillips, USI		"	Z/N		✓
EP17	Unipol		"	Support		✓
EP10	"		"	"		✓
DAVISON CHEMICAL DIVISION, W. R. GRACE & CO.						
Catalysts proprietary to Phillips Petroleum Co. and Union Carbide Corp. processes.						
DUTRAL/AUSIMONT GROUP						
GF1B	Low press. polymerization, slurry	Gran.	$MgCl_2$	Ti	Commercial	
GF1C	"		"	"	"	
GF1E	Low press, polymerization, gas phase		"	"	Under development	
SF1B	"		"	"	"	
LA ROCHE CHEMICALS						
A-201 7×12		Sph.	Active alumina	Active alumina	Abrasion resist., adsorbant in liquid phase	
A-204-1 7×12		"	"	P	Low isom., high strength, attrition resist.	
PQ CORP.						
C-23300		Powder, gran.	SiO_2		Silica support	✓
C-23302		"	"		"	✓
C-23340		"	"		"	✓
C-24302		"	"		"	✓
C-24340		"	"		"	✓
C-34300MS		"	"		"	✓
Linear low-density polyethylene						
CROSFIELD CATALYSTS						
EP20	Phillips, USI, Unipol		SiO_2	Cr/SiO_2		✓
EP30	"		"	"		✓
EP118	"		"	"		✓
EP200	"		"	$Cr/Al/SiO_2$		✓
EP250	Phillips, USI		"	Z/N		✓
EP17	Unipol		"	Support		✓
EP10	"		"	"		✓
DUTRAL/AUSIMONT GROUP						
GF1B	Low press. polymerization	Gran.	$MgCl_2$	Ti	Commercial	
GF1E	"	"	"	"	Under development	
SF1B	"	"	"	"	"	
T4S-L	High press. polymerization				High yield	
DAVISON CHEMICAL DIVISION, W. R. GRACE & CO.						
Catalysts proprietary to Union Carbide Corp. processes.						
PQ CORP.						
CS-1040	Unipol	Powder, gran.	SiO_2		Silica support	✓
CS-1231	"	"	"		"	✓
CS-1022	"	"	"		"	✓
CS-2040	"	"	"		High pore volume, thermal stab. to >900° C.	✓
CS-2133	"	"	"		"	✓
MS-1340		Sph.	"		"	✓
MS-3040		"	"		3.0 cc/g pore volume, attrition resistant	✓
Polypropylene						
LA ROCHE CHEMICALS						
A-204-4 5×8	Purified polypropylene	Sph.	Active alumina	P	Promoted active alumina	✓

Linear low-density polyethylene — continued

Ethylene oxide

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
NIPPON SHOKUBAI KAGAKU KOGYO CO. LTD.						
—	Ethylene oxidation					✓
SHELL CHEMICAL CO.						
S-849	Oxidation				High selectivity, activity, O_2 and air oxidation plants	✓
S-859	"				"	✓

Vinyl acetate

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
DUTRAL/AUSIMONT GROUP						
MAVC	From acetylene	Pellets	Active carbon	Zn acetate		✓

Vinyl chloride

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
DUTRAL/AUSIMONT GROUP						
MCV 2	From acetylene	Pellets	Active carbon	$HgCl_2$		✓
MCV 3	"	"	"	"		✓
MCV 4	"	"	"	"		✓
MCV 5	"	"	"	"		✓
KATALYSATORENWERKE HÜLS GmbH						
H 77 59	Acetylene process	Ext.	Acti. charcoal	$HgCl_2$		✓
LA ROCHE CHEMICALS						
A-203-C1		Sph.	Al_2O_3	P	Chloride removal from VCM	✓
UNITED CATALYSTS INC.						
C78 Series	Ethylene dichloride process	Powder	Al_2O_3	$CaCl_2$		✓

Ethylene dichloride

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
AKZO-KETJEN CATALYSTS						
Oxychlor	BF Goodrich	Fluid	P	P	BF Goodrich proprietary catalysts	L

Acrylonitrile

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
AKZO-KETJEN CATALYSTS						
C41	BP Chemicals	Fluid	P	P	BP chemicals proprietary catalysts	L
C49	"	"	"	"	"	L
NS 733A-DFL	"	"	"	"	"	L
UNITED CATALYSTS INC.						
Catalysts custom compounded for proprietary processes.						

Acrylates

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
NIPPON SHOKUBAI KOGYO CO. LTD.						
—	Propylene oxidation				Acrylic acid & acrolein	L
UNITED CATALYSTS INC.						
Catalysts custom compounded for proprietary processes.						L

Acetaldehyde

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
DUTRAL/AUSIMONT GROUP						
MP 60		Liquid		$PdCl_2$ in aquious solution		✓
ENGELHARD CORP.						
CU1808	Dehydrogenation of ethanol	Tablet	None	Copper chromite		✓

Cumene

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
BAYER AG						
K 1131	Condensation	Bead	Polystrene	Sulfonic acid		✓
KATALYSATORENWERKE HÜLS GmbH						
H 14 108	Hydrog. of α-methyl-styrene	Ext.	Al_2O_3	Pd	High activity, selectivity	✓
UNITED CATALYSTS INC.						
Z6-06-02	Alkylation	Ext.		USY sieve		✓
C84-1-01	"	Sph.	Kieselguhr	H_3PO_4	High selectivity	✓
C84-3-01	"	Ext.	"	"	High selectivity, high stability	✓
UOP						
SPA-1	UOP cat. condensation	Cyl.	Kieselguhr	Phosphoric acid	High yield, min. heavy alkylate	✓
SPA-2	"	"	"	"	"	✓

OTHER OLEFIN DERIVATIVES & PROCESSES

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
BAYER AG						
K 1131	Condensation	Bead	Polystrene	Sulfonic acid		✓
K 1481	Butene oligomerization	"	"	"		✓

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OTHER OLEFIN DERIVATIVES & PROCESSES — continued

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
DAVISON CHEMICAL DIVISION W. R. GRACE & CO.						
Grade 57	Ethylene hydration	Irreg.	Silica gel	Phosphoric acid	High yield ethyl alcohol production	✓
DUTRAL/AUSIMONT GROUP						
MO1P	Hydrog. of various functional groups in organic compounds	Pellets	Al_2O_3	Pd	—	✓
MO2P	"	"	"	"		
MO3P	"	"	"	"		✓
MO3P/S	*Purification of α-methylstyrene	Sph.	"	"		✓
MPBA	Selective hydrog. of organic compounds	Powder	$BaSO_4$	"	-	✓
						✓
KATALYSATORENWERKE HÜLS GmbH						
H 3103	Hydration of Ethylene, Propylene	Sph.	SiO_2	Phosphoric acid	High selectivity	✓
PROCATALYSE						
LC1252	Dimersol	Liquid		Ni	Propylene, butylene, isomerization	✓
UNITED CATALYSTS INC.						
C84-1-01	Propylene/butene oligomerization	Sph.	Kieselguhr	H_3PO_4	High selectivity	✓
C84-3-01	"	Ext.	"	"		✓
G58B	Hydrogenation	Sph.	Al_2O_3	Pd	Ethylene purification	✓
G31-1A	"	"	"	"	"	✓
G58D	"	Tablet	"	Pd/promoted	Ethylene purification, high selectivity	✓
G-55	"	Sph.	Al_2O_3	Pd/Cr	Vapor phase propylene purification	✓
C31-1	"	"	"	Pd	"	✓
G-68F	"	"	"	"	Liquid phase propylene purification	✓
G-68H	"	Ext.	"	"	"	✓
UOP						
—	Dimerization			Active metals	Octene production	✓

AROMATICS PRODUCTION

Xylene isomerization

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
ENGELHARD CORP.						
0-750	Octafining II, production of C_8 aromatics	Cyl.	P	Pt	Regenerable, high selectivity and stability, max. EB conv. to xylenes	L
KALI-CHEMIE AG						
Beadcat PK Series						
PK N		Bead		Silica/Alumina	High mechanical strength	✓
PK 200		"		"	"	✓
MOBIL RESEARCH & DEVELOPMENT CORP.						
ZSM-5	Mobil high-temp. isom.					✓
UOP						
I-9	UOP Isomar	Sph.		Pt/Zeolite		✓

Disproportionation (transalkylation)

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
KALI-CHEMIE AG						
PY 111	Moving bed	Bead	SiO_2/Al_2O_3	Zeolite	High mechanical strength	✓
PY 113	Moving bed	Bead	SiO_2/Al_2O_3	Zeolite	High mechanical strength	✓
MOBIL RESEARCH & DEVELOPMENT CORP.						
ZSM-5	Mobil selective toluene disproportionation				High purity benzene and mixed xylenes	
UOP						
TA-3		Ext.	Zeolite		C_9's and toluene to benzene and xylenes	✓
TA-4		"	"			✓

AROMATICS DERIVATIVES

Styrene

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
CRITERION CATALYSTS						
105	Dehydrog. of ethylbenzene	Ext.	Fe_2O_3	Cr/K	High activity, low steam requirement	
105 HS	"	"	"	"	Higher selectivity than 105	✓
015	"	"	Fe_2O_3	"	Highest selectivity	✓
025	"	"	"	K	High selectivity, lower steam requirement than 015	✓
						✓
DUTRAL/AUSIMONT GROUP						
MST 75	From ethylbenzene	Pellets	Fe_2O_3	K_2CO_3, promoters		✓
MST 6	"	"	"	"		✓
MOBIL RESEARCH AND DEVELOPMENT GROUP						
ZSM-5						✓

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Styrene — continued

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
UOP						
OC-4	Styro-plus				High purity styrene	✓
UNITED CATALYSTS INC.						
G-64C	Dehydrog. of ethylbenzene	Ext.	Fe_2O_3	Cr/K	Moderate activity	✓
G-64E	"	"	"	"	Very low steam/EB requirements	✓
G-64J	"	"	"	K	Very high selectivity, moderate steam/EB	✓
G-64 SX	"	"	"	"	High activity, low steam/EB	✓
G-64I	"	"	"	"	High selectivity, moderate steam/EB	✓
G-64K	"	"	"	"	High activity, moderate selectivity, low steam/EB	✓
G-64M	"	"	"	"	Low steam/EB	✓
G-84B	"	"	"	Cr/K	High activity, low steam/EB	✓
G-84C	"	"	"	K	High activity, high selectivity, low steam/EB	✓

Cyclohexane

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
CROSFIELD CATALYSTS						
HTC-300		Cyl. & Ext.	Alumina	Ni/Promoters	High Ni surface area, various metal loadings	✓
HTC-400		"		"	"	✓
HTC-500		"	"	"	"	✓
ENGELHARD CORP.						
Ni 3288	Hydrog. of benzene	Ext.	SiO_2/Al_2O_3	Ni	Fixed bed	
Ni 0104	"	Tablet	SiO_2	"	"	
Ni 5124	"	Gran.	SiO_2/Al_2O_3	"	Slurry	
KATALYSATORENWERKE HÜLS GmbH						
H 10 125	Hydration of benzene	Ext.	AL_2O_3	Ni	—	✓
H 14 163	"	"	"	Ru		
UOP						
H-3	Hydrog. of benzene	Sph.	Alumina	Pt	High purity cyclohexane in fixed bed process	
H-4	"	"	"	Ni		
PROCATALYSE						
NIPS 2		Powder		Ni	Non pyrophoric	✓
HC 1023		Liquid		"	Easy handling	✓
HC 1025				"		✓
UNITED CATALYSTS INC.						
G87	Benzene hydrog.	Sph./Ext.	Al_2O_3	Ni		✓
G46-8	"	Ext.	"	"	High activity	✓
G-98-B	"	Tablet	SiO_2	Ni/Cu	"	✓
G-97	"	"	Al_2O_3	Pt		✓

Phenols

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
BAYER AG						
K-2431	Phenol purification	Bead	Polystyrene	Sulfonic acid		✓
KATALYSATORENWERKE HÜLS GmbH						
H 14 108	Hydrog. of α-methyl styrene	Ext.	Al_2O_3	Pd	High space velocity, high selectivity	✓

Terephthalic acid

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
DUTRAL/AUSIMONT GROUP						
MPB5	Purification of terephthalic acid	Gran.	Active carbon	Pd		✓

Maleic anhydride

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
DUTRAL/AUSIMONT GROUP						
MAT5	From benzene	Rings		V_2O_5, MoO_3		✓
KATALYSATORENWERKE HÜLS GmbH						
KO 648	Benzene oxid.	Sph.	AL_2O_3/SiO_2	—	Long life time high product quality	✓
NIPPON SHOKUBAI KAGAKU KOGYO CO. LTD.						
—	Benzene oxidation					✓
UNITED CATALYSTS INC.						
Custom compounded for proprietary processes.						L

Phthalic anhydride

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
NIPPON SHOKUBAI KAGAKU KOGYO CO. LTD.						
—	Naphthalene or o-xylene oxidation					✓

SYNGAS PROCESSES

Ammonia

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
ENGELHARD CORP.						
Selectoxo	Ammonia plants		P	P		
As	Ammonia synthesis		P	P		

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Ammonia — continued

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
HALDOR TOPSOE A/S						
TK-250	Steam reforming	Rings		MoO_3/CoO	High activity, low pressure drop	✓
TK-251	"	"		MoO_3/NiO	"	✓
HTG-1	Chlorine absorption	"	Al_2O_3	Alkali	Optimized pore system	✓
HTZ-3	Sulfur absorption	Cyl.		ZnO		✓
HTZ-4	"	"		ZnO/Al_2O_3	Specially promoted	✓
HTZ-5	"	"		ZnO	High pore volume	✓
R-67	Steam reforming	Ring	$MgAl_2O_4$	NiO	Low tube skin temp., low pressure drop	✓
R-67-7H	Steam reforming	7-hole shape	$MgAl_2O_4$	NiO	Higher activity	✓
RK-69	"	Ring	"	"	High hydrocarbons	✓
RK-69-7H	"	7-hole shape	"	"	"	✓
RKS-2	"	Ring	"	"	Stable pore system	✓
RKS-2-7H	"	7-hole shape	"	"	Very high thermal stability	
RKNR	Naphtha reforming	Ring		Ni	Alkali free	✓
RK-68	"	Ring		"	Alkali promoted	✓
RK-68-7H	"	7-hole shape		"	"	✓
RKNGR	Adiabatic reforming	Tablet		"	Non-acidic support	✓
SK12	High-temp. shift	"		Fe/Cr prom.	High and stable activity	✓
LK-811	Med. temp. shift	"		Cu/Cr/Zn	Wider range of operating conditions	✓
LSK	Low temp. shift	"			Chlorine guard	✓
LK-801	"	"		Cu/Zn/Alumina	Large ZnO adsorp. area	✓
LK-821	"	"			Low steam/carbon ratio	✓
PK-5	Methanation	Ring		Ni	High act./low press. drop	✓
MCR	"	Tablet			Meth. of CO and CO_2 rich gases	✓
SSK	S tolerant shift	Sph.			High act. at low temp.	✓
CKA	COS hydrolysis	Cyl.			Plants based on partial oxydation of S-containing feeds	✓
KM-1	Ammonia synthesis	Irreg.		Fe/Ca/Al/K	High activity, long life	✓
KM-2	"	"		"	"	✓
KM-1R	"	"		"	Prereduced version	✓
KM-2R	"	"		"	"	✓
ICI CATALYSTS/ICI KATALCO						
41-6	HDS	Ext.	Alumina	CoO/MoO	Long life	✓
61-1	HDS	"	"	"	Long life	✓
59-3	Chloride removal	Sph.			High-temp. chloride removal	✓
32-4	Sulfur removal	"	ZnO		High activity, capacity	✓
23-1	Nat. gas reforming	Ring	Alumina	NiO	Long life	✓
23-4	"	4-hole ring	"	"	High heat trans.	✓
25-4	Hvy. nat. gas reforming	"	Ca Aluminate	"	High heat trans., self cleaning	✓
46-9	Nat. gas, C_4 reforming	Ring	"	"	Flexible reforming	✓
57-3	Nat. gas reforming	Ring	"	"	Long life	✓
57-4	"	4-hole ring	"	"	High heat transfer	✓
46-8	Nat. gas, C_4 reforming	"	"	"	High heat transfer, difficult duties	✓
46-1	Naphtha reforming	Ring	Refractory	NiO/Potash	Low steam ratio	✓
46-4	"	"	"	"	"	✓
54-3	Secondary reforming	Cyl.	Alumina	NiO	Long life	✓
23-2	"	Rings	"	"	"	✓
54-4	"	"	Ca Aluminate	"	"	✓
71-[illegible]	HT shift	Cyl.		Fe_2O_3/Cr_2O_3	Low sulfur, high strength	✓
71-2	"	"		"	"	✓
15-4	"	"		"	"	✓
15-5	"	"		"	"	✓
52-2	Low temp. shift	"	Alumina	CuO/ZnO	Long life	✓
52-2M	"	"	"	"	"	✓
53-1	"	"	"	"	Extended life	✓
11-3	Methanation	"	Refractory	"	High-activity methanation	✓
11-4	"	"	"	"	"	✓
35-4	Synthesis	Irreg.		Fe_2O_3	High activity	✓
LA ROCHE CHEMICALS						
A-203C1	Refinery offgas	Sph.	Al_2O_3	P	Chloride adsorption	✓
UNITED CATALYSTS INC.						
C73-1-01	Synthesis	Granular	Fe_2O_3	Ca/Al/K	High activity, long life	✓

Methanol

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
HALDOR-TOPSOE A/S						
TK-250	Hydrodesulf.	Rings		MoO_3/CoO	High act., low press. drop	✓
TK-251	"	"		NiO	"	✓
HTG-1	Chlorine absorp.	Cyl.	Al_2O_3	Alkali	Optimized pore system	✓
HTZ-3	Sulfur absorp.	"		ZnO		✓
HTZ-4	"	"		ZnO/Al_2O_3	Specially promoted	✓
HTZ-5	"	"		ZnO	High pore volume, surf. area	✓
R-67	Steam reforming	Ring	Mg Al_2O_3	NiO	Low tube skin temp., low press drop	✓
R-67-7H	"	7-hole shape	"	"	Higher activity	✓
RK-69	"	Ring	"	"	High hydrocarbons	✓
RK-69-7H	"	7-hole shape	"	"	"	✓
MK-101	Methanol synthesis	Tablet		Zn/Al/Cu	High stable activity	✓
ICI CATALYSTS/ICI KATALCO						
41-6	HDS	Ext.	Alumina	CoO/MoO	Long life	✓
61-1	"	"	"	NiO/MoO	"	✓
59-3	Chloride removal	Sph.			High temp. chloride removal	✓
32-4	Sulfur removal	"	ZnO		High activity, capacity	✓
23-1,23-3	Nat. gas reforming	Ring	Alumina	NiO	Long life	✓
23-4	"	4-hole ring	"	"	High heat trans., self cleaning	✓
25-4	Hvy. nat. gas reforming	"	Ca Aluminate	"	High heat trans., self cleaning	✓
46-9	Nat. gas, C_4 reforming	Ring	"	"	Flexible reforming	✓

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Catalyst designation	Process	[illegible]	Carrier support	Active agents	Comments	Availability
57-3	Nat. gas reforming	Ring	"	"	Long life	✓
57-4	"	4-hole ring	"	"	High heat transfer	✓
46-8	Nat. gas C_4 reforming	"	"	"	High heat transfer, difficult duties	✓
46-1	Naphtha reforming	Ring	Refractory	NiO/Potash	Low steam ratio	✓
46-4	"	"	"	"	"	✓
51-2	Synthesis	Cyl.	Alumina	CuO/ZnO	Long life, high activity	✓
LA ROCHE CHEMICALS						
A-203C1	Refinery offgas	Sph.	Al_2O_3	P	Chloride adsorption	✓
UNITED CATALYSTS INC.						
C79-4-GL	Synthesis, MeOH	Tablets	Zn	Cu	Licensed	L

Acetic acid

ICI CATALYSTS/ICI KATALCO						
41-6	HDS	Ext.	Alumina	CoO/MoO	Long life	✓
61-1	"	"	"	NiO/MoO	"	✓
59-3	Chloride removal	Sph.			High temp. operation	✓
32-4	Sulfur removal	"	ZnO		High activity, capacity	✓
23-1	Nat. gas reforming	Ring	Alumina	NiO	Long life	✓
23-3	"	"	"	"	"	✓
23-4	"	4-hole ring	"	"	High heat transfer	✓
25-4	Hvy. nat. gas reforming	"	Ca Aluminate	"	High heat transfer, self cleaning	✓
46-9	Nat. gas, C_4 reforming	Ring	"	"	Flexible reforming	✓
57-3	Nat. gas reforming	"	"	"	Long life	✓
57-4	"	4-hole ring	"	"	High heat transfer	✓
46-8	Nat. gas. C4 reforming	4-hole ring	Ca Aluminate	NiO	High het transfer, difficult duties	✓
46-1	Naphtha reforming	– Ring	Refractory	MoO, Potash	Low steam ratio	✓
46-4	"	"	"	"	"	✓
LA ROCHE CHEMICALS						
A-203C1	Refinery offgas	Sph.	Al_2O_3	P	Chloride adsorption	✓

Methylamines

AKZO-KETJEN CATALYSTS						
MA3-5P	Leonard	Tablets				✓
LA30-5P	Various	"				✓
KDC-4	"	"			High activity & stability, low density	✓

Methylchloride

KATALYSATORENWERKE HÜLS GmbH						
H 7407	Production from methanol and HCl	Tablets, etc.	Al_2O_3		Large-scale production	✓

Hydrogen

HALDOR-TOPSOE A/S						
TK-250	Hydrodesulf.	Rings		MoO_3/CoO	High activity, low pressure drop	✓
TK-251	"	"		MoO_3/NiO	"	✓
HTG-1	Chlorine absorption	Rings	Al_2O_3	Alkali	Optimized pore system	✓
HTZ-3	Sulfur absorption	Cyl.		ZnO		✓
HTZ-4	"	"		ZnO/Al_2O_3	Specially promoted	✓
HTZ-5	"	"		ZnO	High pore volume, surface area	✓
R-67	Steam reforming	Ring	$MgAl_2O_4$	NiO	Low tube skin temp., low pressure drop	✓
R-67-7H	"	7-hole shape	"	"	Higher activity	✓
RK-69	"	Ring	"	"	High hydrocarbons	✓
RK-69-7H	Steam reforming	7-hole shape	$MgAl_2O_4$	NiO	High hydrocarbons	✓
RKS-2	"	Ring	"	"	Very high thermal stability	✓
RKS-2-7H	"	7-hole shape	"	"	Higher bulk activity, lower pressure drops	✓
RKNR	Naphtha reforming	Ring		Ni	Alkali free	✓
RK-68	"	"	$MgAl_2O_3$	"	Alkali promoted	✓
RK-68-7H	"	7-hole shape	"	"	"	✓
RKNGR	Adiabatic reforming	Tablet		"	Non-acidic support	✓
SK-12	High-temp. shift	"		Fe/Cr prom.	High and stable activity	✓
LK-811	Med. temp. shift	"		Cu/Cr/Zn	Wide range of operating conditions	✓
LSK	Low temp. shift	"			Chlorine guard	✓
LK-801	"	"		Cu/Zn/Alumina	Large ZnO adsorption area	✓
LK-821	"	"			Low steam to carbon ratio	✓
PK-5	Methanation	Ring		Ni	High activity, low press. drop	✓
MCR	"	Tablet			Meth. of CO and CO_2 rich gases	✓
SSK	S tolerant shift	Sph.			High activity at low temp.	✓
CKA	COS hydrolysis	Cyl.			Plants based on partial oxidation of S-containing feeds	✓
ICI CATALYSTS/KATALCO						
41-6	HDS	Ext.	Alumina	CoO/MoO	Long life	✓
61-1	"	"	"	"	Long life	✓
59-3	Chloride removal	Sph.			High-temp. chloride removal	✓
32-4	Sulfur removal	"	ZnO		High activity, capacity	✓
23-1, 23-3	Nat. gas reform.	Ring	Alumina	NiO	Long life	✓
23-4	"	4-hole ring	"	"	High heat trans.	✓
25-4	Hvy. nat. gas reforming	4-hole ring	Ca Aluminate	NiO	High heat trans., self cleaning	✓
46-9	Nat. gas, C_4 reforming	Ring	"	"	Flexible reforming	✓
57-3	Nat. gas reforming	"	"	"	Long life	✓
57-4	"	4-hole ring	"	"	High heat transfer	✓
46-8	Nat. gas, C_4 reforming	"	"	"	High heat transfer, difficult duties	✓
46-1	Naphtha reforming	Ring	Refractory	NiO/Potash	Low steam ratio	✓
46-4	"	"	"	"	"	✓
71-1	HT shift	Cyl.		Fe_2O_3/Cr_2O_3	Low sulfur, high strength	✓

OGJ Petrochemical Catalyst Compilation—1988

Hydrogen — continued

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
71-2	"	"		"	"	✓
15-4	"	"		"	"	✓
15-5	HT shift	Cyl.		Fe_2O_3/Cr_2O_3	Low sulfur, high strength	✓
52-2	Low temp. shift	"	Alumina	CuO/ZnO	Long life	✓
52-2M	"	"	"	"	"	✓
53-1	"	"	"	"	Extended life	✓
11-3	Methanation	"	Refractory	"	High activity methanation	✓
11-4	"	"	"	"	"	✓
KATALYSATORENWERKE HÜLS GmbH						
H 14 49	H_2,O_2 removal	Ext.	Al_2O_3	Pd		✓
LA ROCHE CHEMICALS						
A-203C1	Refinery offgas	Sph.	Al_2O_3	P	Chloride adsorption	✓
UNITED CATALYSTS INC.						
C11-2	Steam reforming	Raschig rings	Ca Aluminate	Ni	Nat. gas C_3, H_3 feed, 65-72% H_2	✓
C11-25	"	"	"	"	"	✓
C11-9-01	"	"	Refractory Al_2O_3	"	"	
C11-9-02	"	"	"	"	"	✓
C11-9-03	"	"	"	"	"	✓
C11-9-04	"	"	"	"	"	✓
C11-9-06	"	"	"	"	"	✓
C11-9-09-HGS	"	Wheels	"	"	"	✓
G90A, B & C	Steam reforming	Raschig rings	Refractory Al_2O_3	Ni	Nat. gas C_3H_3 feed, 65-72% H_2	✓
G56A B & H	"	"	"	"	"	✓
C11-9-061	"	"	Ca Aluminate	"	C_4H10, naphtha feeds, 65-72% H_2	✓
C11-9-062	"	"	"	"	"	✓
C11-N, NK	"	"	Refractory	Ni	Split loading	✓
C7-2	Desulf. with metals	Ext.	Binder	ZnO	N_6 steam reformer feed, S free streams	✓
C7-4	"	"	"	"	"	✓
G72-0	"	"	"	"	"	✓
G-1	Conv. of S to H_2S, absorption of H_2S	Tablets	P	P	N_6 streams	✓
C12-3-05	High temp. shift	Tablets		Fe/Cr	CO free gas	✓
G3	"	"		"	"	✓
C18HC, HCS	Low temp. shift	"		Cu	"	✓
G66 A, B	"	"		"	"	✓
C13-3	Methanation	"	Refractory	Ni	H_2 w/o CO, CO_2	✓
C13-4	"	Sph.	"	"	"	✓
C13-5	"	"	"	"	"	✓
C25-2-02	CO/H_2O shift	Ext., tablet	Al_2O_3	Co/Mo	Partial oxidation H_2S containing gas	✓
G65	CO/H_2O shift	Ext., tablet	Al_2O_3	Co/Mo	"	✓
G65RS	"	"	"	"	Withstands elevated temp.	✓
G87	Methanation	Ext.	Al_2O_3	Co/Mo	Partial oxidation H_2S containing gas	✓
G87RS	"	Sph.	"	"	"	✓

OTHER

Catalyst designation	Process	Form	Carrier support	Active agents	Comments	Availability
AKZO-KETJEN CATALYSTS						
C25W	Pyridine production	Fluid				✓
BAYER AG						
K-2631	MTBE production	Bead	Polystyrene	Sulfonic acid		✓
K-2634	MIBK, TAME	"	"	Pd/Sulfonic acid		✓
K-6333	Water deoxygenation	"	"	Pd		✓
ENGELHARD CORP.						
DynOcel	Dessicant/adsorbent	Sph.	Al_2O_3	Al,Ti,Fe,Si oxides	Strong high attritian resistant., high thermal stability, long life	✓
Porocel	"	Gran.	"		High attrition resist., high thermal stability, long life	
ICI CATALYSTS/ICI KATALCO						
38-6	Selective hydrogenation of acetylenes and dienes					✓
Various	Removal of trace contaminants from olefins, sulfur, arsine, chlorides, CO_2					✓
KATALYSATORENWERKE HÜLS GmbH						
H 5444	Water deoxygen.	Ext.	Al_2O_3	Pd	—	✓
H 1424	Selective hydrogenation of acetylenes and dienes	Ext.	Al_2O_3	Pd	High selectivity	✓
H 10 111 rs	Dearomatisation of naphtha cuts and solvents	Tabl.	SiO_2	Ni/Zn	Sulfur stable	✓
H 10 126 rs	"	"	"	"	Large pore volume	✓
H 10 125	"	Extr.	Al_2O_3	Ni	High activity	✓
H 14 163	"	"	"	Ru	—	✓
MOBIL RESEARCH & DEVELOPMENT CORP.						
ZSM-5	Methanol to gasoline					
"	Olefins to gasoline and distillates					
"	Methanol to olefins					
PROCATALYSE						
LD 143	Benzene hydrogenation		Alumina	Ni		✓
CU640	Cyclohexanol dehydrogenation		Silica	Cu		✓
UOP						
DeH-6	Oleflex	Sph.	P	Pt	Olefins	L
DeH-7	Pacol dehydrogenation	"	P	Pt	Olefins	L

Annual Refining
Petrochemical
Report

Annual refining survey

Aileen Cantrell
Director of Editorial Surveys

FOR a better understanding of the survey the following information may be of help.

Calendar-day figures reported in this survey are the average volume a refinery unit processes each day including downtime used for turnarounds. This is actual total volume for the year divided by 365.

Stream-day figures represent the amount a unit can process when running full capacity for short periods.

This survey includes only facilities charging whole crude, plus lube plants not charging whole crude.

Totals. The term NR means not reported. When this term appears in the crude columns, the totals reflect conversion to either a stream-day or calendar-day basis to make each column complete.
Crude conversion factor is 0.95.

In the case of catalytic cracking, if a recycle capacity was not reported, state totals will include a volume that is 30% of the fresh feed reported.

Legend. Hydrocracking includes those processes where 50% or more of the feed is reduced in molecular size; for hydrorefining 10% of the feed or less is reduced in molecular size; and for hydrotreating, essentially no reduction in molecular size of feed occurs.

Values for hydrogen volumes represent either generation or upgrading to 90+ % purity.

Cat reforming definitions are:

- Semiregenerative is characterized by shutdown to the reforming unit at specified intervals or at the operator's convenience for regeneration of catalyst in situ.
- Cyclic is characterized by continuous or continual regeneration of catalyst in situ in any one of several reactors that can be isolated from and returned to the reforming operation. This is accomplished without changing feed rate or octane.
- Other includes: Nonregenerative—catalyst replaced by fresh catalyst; continuous — continuous regeneration of a part of the catalyst in a special regenerator followed by continuous addition to the reactor; moving-bed catalyst systems.

Detailed U.S. breakdown by company, plant, and state starts next page. Included are:

- U.S. crude capacity and downstream production by states.
- Detailed U.S. survey.
- Inactive refineries.

Legend

Numbers identify processes in table

THERMAL PROCESSES
1. Gas-oil cracking
2. Thermal cracking
3. Visbreaking
4. Coking (fluid)
5. Coking (delayed)
6. Other

CAT CRACKING
1. Fluid
2. Other

CAT REFORMING
Semiregenerative:
  1. Conventional catalyst
  2. Bimetallic catalyst
Cyclic:
  3. Conventional catalyst
  4. Bimetallic catalyst
Other:
  5. Conventional catalyst
  6. Bimetallic catalyst

CAT HYDROCRACKING
1. Distillate upgrading
2. Residual upgrading
3. Lube-oil manufacturing
4. Other

CAT HYDROREFINING
1. Residual desulfurizing
2. Heavy gas-oil desulfurizing
3. Cat-cracker and cycle-stock feed pretreatment
4. Middle distillate
5. Other

CAT HYDROTREATING
1. Pretreating cat-reformer feeds
2. Naphtha desulfurizing
3. Naphtha olefin or aromatics saturation
4. Straight-run distillate
5. Other distillate
6. Lube-oil "polishing"
7. Other

ALKYLATION
1. Sulfuric acid
2. Hydrofluoric acid

AROMATICS/ISOMERIZATION
1. BTX
2. Hydrodealkylation
3. Cyclohexane
4. C_4 feed
5. C_5 feed
6. C_5 and C_6 feed

HYDROGEN
1. Steam methane reforming
2. Steam naphtha reforming
3. Partial oxidation
4. Cryogenic
5. Other

NR—not reported

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Survey of operating refineries in the U.S. (state capacities as of January 1, 1988)

		Crude capacity		Charge capacity, b/sd								Production capacity, b/sd					
State	No. plants	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alkyla-tion	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Alabama	2	124,500	128,900	34,000	10,000	......	......	27,000	......	13,000	43.500	......	6,000	......	10,500	8.0	400
Alaska	6	225,000	239,093	6,000	......	......	......	12,000	9,000	......	12,000	......	6,500	......	8,000	12.8	......
Arizona	1	5,700	6,000	2,000	......	......	......	......	......	......	......	......	......	......	1,160	......	......
Arkansas	3	58,570	61,000	30,500	......	18,500	775	9,000	......	......	20,000	4,800	......	4,000	9,700	2.8	......
California	28	2,317,793	2,426,939	1,291,265	492,800	628,000	34,600	533,300	378,000	433,000	900,780	109,000	17,900	30,200	76,854	908.4	19,622
Colorado	2	76,500	80,000	23,000	......	23,500	1,000	17,500	......	......	27,500	......	......	......	4,000	......	......
Delaware	1	140,000	150,000	95,000	46,000	65,000	5,000	56,000	19,000	......	110,000	8,000	3,370	......	......	40.0	2,180
Georgia	2	34,500	37,500	......	......	......	......	......	......	......	......	......	......	......	26,500	......	......
Hawaii	2	116,000	120,500	68,000	13,000	22,000	......	12,000	16,000	......	3,500	7,000	1,500	......	1,300	2.5	......
Illinois	6	920,600	977,000	358,500	103,400	339,000	40,600	294,300	66,000	35,000	531,300	83,000	18,800	4,600	36,600	64.3	6,175
Indiana	4	424,600	438,500	232,200	27,500	167,000	12,100	99,000	......	80,000	153,300	33,900	35,500	6,400	45,500	......	1,550
Kansas	7	352,600	371,183	119,650	52,000	125,000	15,450	89,600	3,190	44,000	133,000	36,200	37,469	2,500	5,200	......	2,070
Kentucky	2	218,900	226,300	90,000	57,600	100,000	......	53,500	......	40,000	147,300	12,000	17,400	7,900	30,000	20.0	......
Louisiana	17	2,273,015	2,374,300	906,300	408,500	824,000	22,800	499,300	149,000	286,000	893,600	174,500	71,800	37,000	55,500	162.6	14,275
Michigan	4	120,100	127,094	30,000	......	45,000	1,300	31,500	......	14,000	44,800	4,000	6.000	......	10,000	......	......
Minnesota	2	222,143	229,220	132,000	54,000	78,000	1,000	49,500	......	86,500	127,000	17,700	23,300	......	49,000	20.0	2,800
Mississippi	5	358,600	379,404	285,600	70,000	74,000	7,400	95,800	68,000	189,000	59,800	19,700	5,500	2,000	40,600	215.0	3,450
Montana	4	137,200	143,000	55,250	7,700	50,600	7,700	35,500	4,900	14,000	100,200	11,400	5,400	......	23,500	19.3	435
Nevada	1	4,500	4,700	2,500	......	......	......	......	......	......	......	......	......	......	......	......	......
New Jersey	6	435,000	456,368	251,900	21,500	256,000	37,000	77,500	......	65,000	216,800	23,000	28,400	8,500	73,000	11.0	1,010
New Mexico	3	72,800	77,107	6,000	......	27,200	3,400	16,600	......	......	28,300	3,600	4,000	......	3,400	......	......
North Dakota	1	58,000	60,000	......	......	26,000	5,200	12 100	......	......	16,600	3,400	4,000	......	......	......	......
Ohio	4	482,650	508,000	255,000	29,900	176,000	16,500	156,000	86,000	23,000	157,000	26,100	64,900	2,100	19,000	72.0	1,250
Oklahoma	6	387,000	403,815	131,500	20,500	134,500	11,840	90,000	5,000	......	139,000	35,400	28,700	9,500	12,300	10.0	1,040
Oregon	1	15,000	15,789	16,000	......	......	......	......	......	......	......	......	......	......	11,500	......	......
Pennsylvania	8	727,200	771,000	319,180	......	259,300	8,300	208,820	51,000	50,000	434,050	44,000	20,250	21,310	33,000	43.5	......
Tennessee	1	57,000	60,000	12,000	......	30,000	......	10,000	......	......	31,000	3,000	4,000	......	3,500	......	......
Texas	31	4,090,800	4,339,600	1,850,100	362,000	1,608,500	174,750	1,129,400	257,500	825,000	2,192,550	286,000	297,365	93,500	78,400	623.0	21,669
Utah	6	154,500	160,768	45,550	8,500	55,800	9,600	29,100	......	7,100	32,100	12,800	6,350	......	1,700	......	350
Virginia	1	51,000	53,000	29,000	13,500	27,500	2,000	9,500	......	......	25,000	......	......	......	......	......	825
Washington	7	458,175	477,043	220,000	68,000	100,000	19,500	119,800	52,000	25,500	165,500	23,400	2,750	......	16,600	80.0	3,280
West Virginia	1	10,500	10,800	8,850	......	......	......	3,400	4,500	......	3,900	......	......	4,440	......	1.2	......
Wisconsin	1	32,000	34,000	20,500	......	9,700	1,000	8,000	......	......	15,000	1,200	2,000	......	13,500	......	......
Wyoming	6	165,300	170,689	62,600	7,000	63,000	7,200	32,350	......	14,350	49,050	10,100	1,200	1,500	11,000	......	380
Total	182	15,327,746	16,118,612	6,989,945	1,873,400	5,333,100	446,015	3,817,370	1,169,090	2,244,450	6,813,430	993,200	720,354	235,450	710,814	2,316.4	82,761

U.S. refineries: location, capacities, types of processing

Company and location	– Crude capacity –		Charge capacity, b/sd								Production capacity, b/sd				Hydrogen (MMcfd)	Coke (t/d)
	b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking —		Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt		
					Fresh feed	Recycle										
ALABAMA																
Hunt Refining Co.—Tuscaloosa	44,500	47,600	14,000	^{5}10,000	......	......	^{2}6,000	......	^{2}9,000 ^{4}4,000	^{1}6,000 ^{3}1,500	......	......	......	10,500	^{1}8.0	400
Louisiana Land & Exploration Co.—Saraland	80,000	81,300	20,000	......	......	......	^{2}21,000	......	......	^{1}21,000 ^{7}15,000	......	^{6}6,000	......	......	......	......
Total	124,500	128,900	34,000	10,000	......	......	27,000	......	13,000	43,500	......	6,000	......	10,500	8.0	400
ALASKA																
Arco Alaska Inc.—Kuparuk	12,000	12,000	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Prudhoe Bay	22,000	22,000	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Chevron U.S.A. Inc.—Kenai	22,000	NR	......	......	......	......	......	......	......	......	......	......	......	6,000	......	......
Mapco Petroleum Inc.—North Pole	90,000	NR	6,000	......	......	......	......	......	......	......	......	^{1}2,500	......	2,000	......	......
Petro Star Inc.—North Pole	7,000	7,200	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Tesoro Petroleum Corp.—Kenai	72,000	80,000	......	......	......	......	^{4}12,000	^{2}9,000	......	^{1}12,000	......	^{6}4,000	......	......	^{1}12.8	......
Total	225,000	239,093	6,000	......	......	......	12,000	9,000	......	12,000	......	6,500	......	8,000	12.8	......
ARIZONA																
Intermountain Refining Cl—Fredonia	5,700	6,000	2,000	......	......	......	......	......	......	......	......	......	......	1,160	......	......
ARKANSAS																
Berry Petroleum Co.—Stevens	3,800	4,000	1,500	......	......	......	......	......	......	......	......	......	......	1,000	......	......
Cross Oil & Refining Co. of Arkansas—Smackover	6,770	7,000	4,000	......	......	......	......	......	......	^{6}4,500	......	......	4,000	2,200	^{1}2.8	......
Lion Oil Co.—El Dorado^{1}	48,000	50,000	25,000	......	^{1}18,500	775	^{2}9,000	......	......	^{1}10,000 ^{5}5,500	^{1}4,800	......	......	6,500	......	......
Total	58,570	61,000	30,500	......	18,500	775	9,000	......	......	20,000	4,800	......	4,000	9,700	2.8	......

Solvent extraction: ^{1}5,500 b/d.

Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
CALIFORNIA																
Anchor Refining Cl—McKittrick	10,000	11,000	7,000	......	......	......	......	......	......	......	......	......	......	......	......	......
Atlantic Richfield Co.—Carson	214,000	225,000	112,000	^{5}56,000	^{1}77,000	None	^{2}48,000	^{1}22,000	......	^{1}40,000 ^{4}18,000 ^{5}8,000 ^{7}80,000	^{1}9,000 *2,400	......	......	......	^{1}70.0	2,500
Chevron U.S.A. Inc.—El Segundo	405,000	NR	179,000	^{5}54,000	^{1}60,000	None	^{2}60,000	^{1}45,000	^{1}24,000 ^{2}60,000 ^{4}14,000	^{1}56,000 ^{4}18,000	^{1}8,000	^{1}1,500	......	......	^{2}112.0	2,900
Richmond^{1}	350,000	365,000	175,000	......	^{1}63,000	None	^{2}68,000	^{1}45,000 ^{2}30,000 ^{3}30,500	^{2}60,000 ^{4}65,000	^{1}63,000 ^{6}18,200	^{1}9,200 *2,100	......	11,800	11,000	^{1}135.0	......
Conoco Inc.—Santa Maria	9,500	10,000	7,800	......	......	......	......	......	......	......	......	......	......	6,800	......	......
Edgington Oil Cl—Long Beach	41,600	44,730	21,165	......	......	......	......	......	......	......	......	......	......	15,554	......	......
Exxon Co.—Benicia	126,000	130,000	63,000	^{4}27,500	^{1}64,000	11,000	^{3}28,000	^{1}29,500	^{2}37,000	^{1}22,500 ^{2}22,000 ^{4}12,500 ^{5}12,500 ^{7}17,000	^{1}14,000 *2,000	......	......	......	^{1}104.0	1,100

Company and location	– Crude capacity – b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
			Charge capacity, b/sd								Production capacity, b/sd					
Fletcher Oil & Refining Co.—Carson	29,500	30,500	......	......	^{1}10,500	1,000	^{4}5,000	.....	^{2}11,500	^{1}5,000	......	......	......	......	......	......
Golden Bear Division, Witco Chemical Corp.—Oildale	10,818	11,500	11,500	......	......	......	......	......	......	^{6}780	......	......	4,800	3,300	......	......
Golden West Refining Co.—Santa Fe Springs	40,600	42,300	25,000	^{3}13,800	^{1}13,500	None	^{2}19,000	^{1}11,000	......	^{2}12,000	^{2}3,000	......	......	4,000	^{1}11.0	......
Huntway Refining Co.—Benicia	8,400	9,000	7,500	......	......	......	......	......	......	......	......	......	......	4,500	......	......
Wilmington	5,500	6,000	5,000	......	......	......	......	......	......	......	......	......	......	3,500	......	......
Kern Oil & Refining Co.—Bakersfield	20,000	22,000	......	......	......	......	^{2}3,000	......	......	^{1}4,500	......	......	......	......	......	......
Lunday-Thagard Co.—South Gate	8,100	8,100	7,000	......	......	......	......	......	......	......	......	......	......	4,200	......	......
Mobil Oil Corp.—Torrance	123,000	130,000	95,000	^{5}48,000	^{1}63,000	None	^{2}36,000	^{1}21,700	......	^{1}21,000 ^{3}16,000 ^{4}28,000	^{2}12,300	......	......	......	^{1}62.0	2,900
Newhall Refining Cl—Newhall	21,400	23,000	10,000	......	......	......	^{3}2,300	......	^{2}6,500	^{1}3,000	......	......	......	5,000	......	......
Oxnard Refinery—Oxnard	NR	4,500	......	......	......	......	......	......	......	......	......	......	......	3,000	......	......
Pacific Refining Co.—Hercules	55,000	NR	17,000	^{3}12,000	......	......	^{2}15,000	^{1}3,500	......	^{1}15,000	......	......	......	......	......	......
San Joaquin Refining Cl—Bakersfield	18,000	20,000	14,000	^{3}10,000	......	......	......	......	......	......	......	......	4,000	5,000	......	......
Shell Oil Co.—Martinez	140,100	143,000	96,500	^{4}22,000	^{1}67,000	1,000	^{3}28,000	^{1}28,000	^{3}50,000	^{2}17,000 ^{3}16,000 ^{5}17,000 ^{6}6,300 ^{7}15,000	^{1}8,000 *3,200	......	4,500	11,000	^{1}110.0	127
Wilmington	129,000	133,000	70,000	^{5}53,000	^{1}42,000	NR	^{2}24,000	......	......	^{2}25,000 ^{3}13,000 ^{5}38,000 ^{7}34,000	^{1}8,600	......	......	......	^{1}36.0	2,500
Sunland Refining Corp.—South Gate	15,000	15,000	......	......	......	......	^{2}1,500	......	......	^{2}1,500	......	......	......	......	......	......
Texaco Refining & Marketing Inc.—																
Bakersfield	41,000	42,000	22,000	^{5}11,800	......	......	^{2}23,000	^{1}14,300	^{2}15,000	^{1}14,000	......	......	......	......	^{1}21.0	625
Wilmington	75,000	78,400	42,000	^{5}48,000	^{1}28,000	8,000	^{2}35,000	^{1}20,000	......	^{1}18,000	^{1}4,400	......	......	......	^{3}48.0	1,650
Tosco Corp.—Martinez	126,000	132,600	105,000	^{4}42,000	^{1}55,000	1,000	^{2}20,000 ^{6}23,000	^{1}23,000	^{3}50,000	^{1}13,500 ^{4}28,000	^{1}12,000	......	......	......	^{1}80.0	1,500
Union Pacific Resources—Wilmington	65,000	70,000	42,000	^{5}24,000	^{1}38,000	None	^{6}14,500	......	^{3}40,000	^{1}15,000	^{2}10,500	^{4}9,000	......	......	......	1,200
Unocal Corp.—Los Angeles	108,000	111,000	83,000	^{3}20,000	^{1}47,000	......	^{2}52,000	^{2}22,000	......	^{1}54,000 ^{5}36,000	^{1}10,000	......	......	......	^{1}49.4	......
Rodeo	118,000	125,100	73,800	^{5}50,700	......	......	^{4}28,000	^{1}32,500	......	^{1}23,000 ^{5}9,500 ^{7}14,000	......	^{6}7,400	5,100	......	^{1}70.0	2,620
Total	**2,317,793**	**2,426,939**	**1,291,265**	**492,800**	**628,000**	**34,600**	**533,300**	**378,000**	**433,000**	**900,780**	**109,000**	**17,900**	**30,200**	**76,854**	**908.4**	**19,622**

Solvent extraction: ^{1}50,000 b/sd.

COLORADO

Company and location	– Crude capacity – b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Colorado Refining Co.—Commerce City	33,500	35,000	10,000	......	^{1}8,500	None	^{2}10,000	......	......	^{1}10,000	*3,500	......	......	......	......	......
Conoco Inc.—Commerce City	43,000	45,000	13,000	......	^{1}15,000	1,000	^{2}7,500	......	......	^{1}7,500 ^{4}10,000	*2,600	......	......	4,000	......	......
Total	**76,500**	**80,000**	**23,000**	......	**23,500**	**1,000**	**17,500**	......	......	**27,500**	......	......	......	**4,000**	......	......

DELAWARE

Company and location	– Crude capacity – b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Texaco Refining and Marketing Inc.—Delaware City	140,000	150,000	95,000	^{4}46,000	^{1}65,000	5,000	^{2}18,000 ^{5}38,000	^{4}19,000	......	^{1}55,000 ^{4}55,000	^{1}8,000 *5,500	^{1}2,900 ^{2}470	......	......	^{1}40.0	2,180
Total	**140,000**	**150,000**	**95,000**	**46,000**	**65,000**	**5,000**	**56,000**	**19,000**	.....	**110,000**	**8,000**	**3,370**	......	......	**40.0**	**2,180**

Company and location	Crude capacity		Charge capacity, b/sd								Production capacity, b/sd					
	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
GEORGIA																
Amoco Oil Co.—Savannah	28,000	30,000	......	......	......	......	......	......	......	......	......	......	......	22,500	......	......
Young Refining Corp.—Douglasville	6,500	7,500	......	......	......	......	......	......	......	......	......	......	......	4,000	......	......
Total	**34,500**	**37,500**	......	......	......	......	......	......	......	......	......	......	......	**26,500**	......	......
HAWAII																
Chevron U.S.A. Inc.—Barber's Point	48,000	NR	28,000	......	[1]22,000	None	......	......	......	[3]3,500	[1]4,500 †2,500	[4]1,500	......	1,300	[1]2.5	......
Hawaiian Independent Refinery Inc.—Ewa Beach	68,000	70,000	40,000	[3]13,000	......	......	[2]12,000	[2]16,000	......	......	......	......	......	......	......	......
Total	**116,000**	**120,500**	**68,000**	**13,000**	**22,000**	......	**12,000**	**16,000**	......	**3,500**	**7,000**	**1,500**	......	**1,300**	**2.5**	......
ILLINOIS																
Clark Oil & Refining Corp.—Blue Island	64,600	68,000	27,000	......	[1]25,000	1,000	[2]30,500	[1]9,500	......	[1]20,500	[2]6,000	......	......	4,500	......	......
Hartford	60,000	65,000	18,000	[5]14,500	[1]26,000	1,000	[2]12,000	......	......	[1]12,000 [4]4,000 [5]8,000	......	......	......	......	......	750
Marathon Petroleum Co.—Robinson	195,000	205,000	62,000	[3]4,000 [5]22,000	[1]38,000	400	[4]38,000 [5]41,000	[1]23,000	[5]6,000	[1]65,000 [4]11,500	[2]12,000	[6]11,500	......	......	[1]25.0	1,200
Mobil Oil Corp.—Joliet	180,000	200,000	88,000	[5]35,000	[1]98,000	None	[2]46,000	......	......	[1]72,000 [2]9,000 [5]75,000	[2]25,000	......	......	......	......	2,225
Shell Oil Co.—Wood River	274,000	286,000	105,500	......	[1]94,000	NR	[2]22,000 [3]75,000	[1]33,500	[3]29,000	[2]64,000 [5]52,500 [6]7,000 [7]35,000	[1]22,000	[1]3,800	4,600	28,500	[1]28.3	......
Unocal Corp.—Lemont	147,000	153,000	58,000	[5]27,900	[1]58,000	10,000	[2]29,800	......	......	[1]29,800 [2]14,200 [3]6,400 [5]39,000 [7]2,100 [7]4,300	[2]18,000	[1]3,500	......	3,600	[1]11.0	2,000
Total	**920,800**	**977,000**	**358,500**	**103,400**	**339,000**	**40,600**	**294,300**	**66,000**	**35,000**	**531,300**	**83,000**	**18,800**	**4,600**	**36,600**	**64.3**	**6,175**
INDIANA																
Amoco Oil Co.—Whiting	350,000	360,000	203,000	[5]27,500	[1]140,000	4,000	[3]85,000	......	[3]80,000	[1]87,000 [5]42,000 [6]4,300	[1]26,000	[1]13,000 [6]21,000	6,400	40,000	......	1,550
Indiana Farm Bureau Cooperative Association Inc.—Mt. Vernon	20,600	21,500	7,200	......	[1]7,000	NR	[2]4,000	......	......	[2]6,000	[2]1,700	[6]1,500	......	......	......	......
Laketon Refining Corp.—Laketon	8,300	10,000	5,000	......	......	......	......	......	......	......	......	......	......	3,500	......	......
Rock Island Refining Corp.—Indianapolis[1]	45,700	47,000	17,000	......	[1]20,000	NR	[2]10,000	......	......	[2]14,000	[2]6,200	......	......	2,000	......	......
Total	**424,600**	**438,500**	**232,200**	**27,500**	**167,000**	**12,100**	**99,000**	......	**80,000**	**153,300**	**33,900**	**35,500**	**6,400**	**45,500**	......	**1,550**

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†Dimersol.

Solvent extraction: [1]4,500.

Company and location	– Crude capacity – b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
			Charge capacity, b/sd								Production capacity, b/sd					
KANSAS																
Derby Refining Co.—El Dorado[1]	29,500	32,000	10,000	......	^{1}14,500	NR	^{2}5,000	......	......	^{1}5,500	^{2}3,200	......	......	3,200	......	......
Wichita	29,500	31,000	10,000	^{5}5,000	^{1}17,000	NR	^{2}7,000	......	......	^{1}6,400	^{2}3,000 *3,000	......	......	......	......	210
Farmland Industries Inc.—Coffeyville	56,500	60,723	19,500	^{5}12,000	^{1}23,000	1,500	^{2}16,000	......	......	^{1}26,500	^{2}6,000	^{6}8,000	2,500	......	......	600
Phillipsburg	26,400	27,460	10,000	......	......	......	^{2}5,300	......	......	^{1}7,500	......	......	......	2,000	......	......
National Cooperative Refinery Association—McPherson	75,600	80,000	27,000	^{5}22,000	^{1}20,000	1,000	^{2}15,000	......	......	^{1}10,000 ^{2}14,500 ^{5}13,000	^{2}6,000	^{4}2,000 ^{6}9,500	......	......	......	650
Texaco Refining & Marketing Inc.—El Dorado	81,500	84,000	27,000	^{5}13,000	^{1}31,500	3,500	^{2}25,000	......	^{3}44,000	^{1}25,000 ^{2}3,500 ^{3}4,800	^{2}12,500	^{1}2,969 ^{6}15,000	......	......	......	610
Total Petroleum Inc.—Arkansas City	53,600	56,000	16,150	......	^{1}19,000	None	^{2}16,300	^{1}3,190	......	^{1}16,300	^{2}5,500	......	......	......	......	......
Total	**352,600**	**371,183**	**119,650**	**52,000**	**125,000**	**15,450**	**89,600**	**3,190**	**44,000**	**133,000**	**36,200**	**37,469**	**2,500**	**5,200**	......	**2,070**
KENTUCKY																
Ashland Petroleum Co.—Catlettsburg	213,400	220,000	90,000	^{2}2,600 †^{6}55,000	^{1}60,000 §45,000	......	^{2}25,500 ^{5}27,000	......	^{3}40,000	^{1}65,000 ^{2}6,000 ^{3}6,000 ^{4}40,000 ^{7}5,000 ^{7}12,000 ^{7}12,000	^{2}12,000 *1,000	^{1}5,400 ^{6}12,000	7,900	30,000	^{1}20.0	......
Somerset Refinery Inc.—Somerset	5,500	6,300	......	......	......	......	^{2}1,000	......	......	^{1}1,300	......	......	......	......	......	......
Total	**218,900**	**226,300**	**90,000**	**57,600**	**100,000**	......	**53,500**	......	**40,000**	**147,300**	**12,000**	**17,400**	**7,900**	**30,000**	**20.0**	......
LOUISIANA																
Atlas Processing Co., Division of Pennzoil—Shreveport	46,200	50,000	24,300	......	......	......	^{2}10,000	......	......	^{1}10,000 ^{6}3,400 ^{7}1,200 ^{7}5,500	......	......	8,500	600	^{1}6.1	......
Calcasieu Refining Co.—Lake Charles	12,000	13,500	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Calumet Refining Co.—Princeton	4,100	4,400	8,000	......	......	......	......	......	......	......	......	......	3,000	1,000	......	......
Canal Refining Co.—Church Point	9,865	10,000	......	......	......	......	^{1}1,900	......	......	......	......	......	......	......	......	......
Citgo Petroleum Corp.—Lake Charles	320,000	330,000	83,000	^{5}63,000	^{1}150,000	None	^{2}46,000 ^{5}45,000	^{1}37,000	^{3}40,000	^{1}91,000 ^{4}14,000	^{1}20,200	......	9,000	......	......	3,000
Conoco Inc.—Westlake	156,500	164,000	63,000	^{2}12,000 ^{5}53,000	^{1}38,000	None	^{2}15,900 ^{5}11,500	......	......	^{1}33,000 ^{4}44,000 ^{5}44,000 ^{7}13,500	^{1}6,000 *2,100	......	......	......	......	3,400
Cotton Valley Refinery (Kerr-McGee Refining Corp.)—Cotton Valley	7,800	8,500	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Exxon Co.—Baton Rouge[1]	455,000	474,000	205,000	^{5}90,000	^{1}155,000	None	^{4}95,000	^{1}24,000	......	^{1}95,000 ^{3}2,500 ^{5}55,000 ^{6}17,000 ^{7}2,000	^{1}33,200 *8,000	......	16,500	28,900	......	1,480

Solvent extraction: [1]5,600 b/sd.

†ART. §Reduced crude converter.

Company and location	Crude capacity		Charge capacity, b/sd								Production capacity, b/sd				Hydrogen (MMcfd)	Coke (t/d)
	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt		
Hill Petroleum Co.—Krotz Springs	55,300	57,500	24,000	......	[1]28,000	None	[2]12,500	......	......	[1]12,500	*6,600	......	......	......	......	......
St. Rose	33 000	34,000	18,000	......	......	......	......	......	......	......	......	......	......	......	......	......
Marathon Petroleum Co.—Garyville	255,000	263,000	125,000	......	[1]85,000	1,000	[5]48,000	......	[2]71,000 [4]38,000	[1]48,000 [4]16,000	[2]26,000	[4]18,500 [6]16,000	......	25,000	......	......
Murphy Oil USA Inc.—Meraux[2]	92,500	95,400	40,000	......	[1]35,000	2,500	[5]23,000	......	......	[1]29,000 [4]15,000	[2]8,700	......	......	......	......	......
Placid Refining Co.—Port Allen[3]	46,000	50,000	20,000	......	[1]18,000	2,000	[2]10,000	......	......	[2]10,000	[2]3,500	......	......	......	......	......
Shell Oil Co.—Norco	215,000	220,000	78,000	[5]21,000 [6]17,700 [6]85,800	[1]90,000	10,000	[2]18,000 [3]38,000	[1]35,000	[3]70,000	[2]29,000 [3]28,000	[1]15,000 *9,400	......	......	......	[1]70.0	1,000
Sohio Oil Co.(BP America)—Belle Chasse	NR	205,000	73,000	[5]21,000	[1]89,000	2,300	[2]37,500	......	......	[2]42 000 [4]24,000 [5]22,000	[2]28,400	[1]24,000 [2]6,300	......	......	......	845
Tenneco Oil Co.—Chalmette	145,000	155,000	70,000	[5]33,000	[1]51,000	None	[2]28,000 [5]19,000	[1]18,000	[3]43,000 [4]24,000	[1]45,000	[2]19,000	[1]7,000	......	......	[1]24.0	1,550
Texaco Refining & Marketing Inc.—Convent	225,000	240,000	75,000	[3]12,000	[1]85,000	5,000	[2]40,000	[2]35,000	......	[1]40,000 [4]37,000 [5]65,000	[1]14,500	......	......	......	[3]62.5	......
Total	**2,273,015**	**2,374,300**	**906,300**	**408,500**	**824,000**	**22,800**	**499,300**	**149,000**	**286,000**	**893,600**	**174,500**	**71,800**	**37,000**	**55,500**	**162.6**	**14,275**

Solvent extraction: [1]28,500 b/sd. [2]12,000 b/sd. [3]5,000 b/sd.

MICHIGAN

Crystal Refining Co.—Carson City	4,000	6,200	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Lakeside Refining Co.—Kalamazoo	5,600	NR	......	......	......	......	[1]1,000	......	......	......	......	......	......	......	......	......
Marathon Petroleum Co.—Detroit	68,500	71,000	30,000	......	[1]27,000	1,300	[2]18,500	......	[3]14,000	[1]21,000	[1]4,000	......	......	10,000	......	......
Total Petroleum Inc.—Alma	42,000	44,000	......	......	[1]18,000	None	[2]12,000	......	......	[1]18,000 [4]2,000 [7]3,800	......	[6]6,000	......	......	......	......
Total	**120,100**	**127,094**	**30,000**	......	**45,000**	**1,300**	**31,500**	......	**14,000**	**44,800**	**4,000**	**6,000**	......	**10,000**	......	......

MINNESOTA

Ashland Petroleum Co.—St. Paul Park	67,143	69,220	32,000	......	[1]23,000	......	[2]23,500	......	[3]23,000	[1]24,500 [4]7,200 [7]8,300	[2]5,500 *350	[6]8,300	......	14,000	......	......
Koch Refining Co.—Rosemount	155,000	160,000	100,000	[5]54,000	[1]55,000	1,000	[6]26,000	......	[3]63,500	[1]26,000 [2]15,000 [4]46,000	[1]8,500 *1,100 †3,700	[6]15,000	......	35,000	[1]20.0	2,800
Total	**222,143**	**229,220**	**132,000**	**54,000**	**78,000**	**1,000**	**49,500**	......	**86,500**	**127,000**	**17,700**	**23,300**	......	**49,000**	**20.0**	**2,800**

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†Dimersol.

MISSISSIPPI

Amerada-Hess Corp.—Purvis	30,000	NR	20,000	[4]8,000	[2]18,000	NR	[2]5,800	......	......	[2]5,800 [4]6,000	[1]3,500	......	......	......	......	250
Chevron U.S.A. Inc.—Pascagoula	295,000	NR	243,000	[5]62,000	[1]56,000	2,000	[2]90,000	[1]68,000	[1]96,000 [3]63,000 [4]30,000	[1]48,000	[1]16,200	[1]5,500	......	20,000	[1]215.0	3,200

	– Crude capacity –		Charge capacity, b/sd								Production capacity, b/sd					
Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Ergon Refining Inc.—Vicksburg	16,800	18,300	15,600	......	......	......	......	......	......	......	......	......	2,000	12,000	......	......
Southland Oil Co.—Lumberton	5,800	6,500	......	......	......	......	......	......	......	......	......	......	......	3,500	......	......
Sandersville	11,000	12,500	7,000	......	......	......	......	......	......	......	......	......	......	5,100	......	......
Total	**358,600**	**379,404**	**285,800**	**70,000**	**74,000**	**7,400**	**95,800**	**68,000**	**189,000**	**59,800**	**19,700**	**5,500**	**2,000**	**40,600**	**215.0**	**3,450**
MONTANA																
Cenex—Laurel[1]	40,400	42,500	14,000	......	^{1}12,000	3,000	^{2}12,000	......	^{4}14,000	^{1}15,000	^{2}3,000	^{4}2,000	......	6,000	......	......
Conoco Inc.—Billings[2]	48,500	50,000	20,000	......	^{1}15,500	1,000	^{2}12,500	......	......	^{4}38,000 ^{5}3,500	^{2}5,000	^{4}3,400	......	6,500	......	......
Exxon Co.—Billings	42,000	44,000	18,000	^{4}7,700	^{1}21,000	3,500	^{1}10,000	^{1}4,900	......	^{2}15,500 ^{4}10,000 ^{5}10,000 ^{7}6,000	^{2}3,400	......	......	11,000	^{5}19.3	435
Montana Refining Co.—Great Falls	6,300	6,500	3,250	......	^{1}2,100	200	^{2}1,000	......	......	^{1}1,000 ^{4}1,200	*270	......	......	......	......	......
Total	**137,200**	**143,000**	**55,250**	**7,700**	**50,600**	**7,700**	**35,500**	**4,900**	**14,000**	**100,200**	**11,400**	**5,400**	......	**23,500**	**19.3**	**435**
Solvent extraction: ^{1}4,000 b/sd. ^{2}8,500 b/sd (PDA).																
NEVADA																
Nevada Refining Co.—Tonopah	**4,500**	**4,700**	**2,500**	......	......	......	......	......	......	......	......	......	......	......	......	......
NEW JERSEY																
Amerada-Hess Corp.—Port Reading	......	......	......	......	^{1}55,000	None	......	......	......		^{1}4,500 *5,000	......	......	......	......	......
Chevron U.S.A. Inc.—Perth Amboy	80,000	85,000	46,000	......	......	......	......	......	......	......	......	......	......	35,000	......	......
Coastal Eagle Point Oil Co.—Westville	90,000	95,000	47,500	......	^{1}45,000	12,000	^{2}26,000	......	......	^{1}26,000 ^{4}12,000	^{1}4,000 *3,300	^{1}1,500 †1,900	......	......	......	......
Exxon Co.—Linden	120,000	125,000	66,000	......	^{1}120,000	25,000	^{4}28,000	......	^{2}50,000	^{1}29,000 ^{2}19,000 ^{5}65,000	^{1}9,500	^{6}25,000	......	38,000	......	......
Mobil Oil Corp.—Paulsboro[1]	100,000	104,000	62,400	^{5}21,500	^{1}36,000	None	^{2}23,500	......	^{5}15,000	^{1}23,500 ^{5}42,000 ^{6}300	^{2}5,000	......	8,500	......	^{1}11.0	1,010
Seaview Petroleum Inc.—Thorofare	45,000	NR	30,000	......	......	......	......	......	......	......	......	......	......	......	......	......
Total	**435,000**	**456,368**	**251,900**	**21,500**	**256,000**	**37,000**	**77,500**	......	**65,000**	**216,800**	**23,000**	**28,400**	**8,500**	**73,000**	**11.0**	**1,010**
Solvent extraction: ^{1}9,500 b/sd. †Cumene.																
NEW MEXICO																
Bloomfield Refining Co.—Bloomfield	16,800	18,107	......	......	^{1}5,400	500	^{2}2,800	......	......	^{2}2,800	......	......	......	......	......	......
Giant Industries Inc.—Gallup	18,000	19,000	......	......	^{1}7,300	400	^{2}6,000	......	......	^{1}6,000	^{2}1,600	^{6}4,000	......	......	......	......
Navajo Refining Co.—Artesia	NR	40,000	6,000	......	^{1}14,500	2,500	^{1}1,800 ^{2}6,000	......	......	^{1}10,000 ^{4}6,500 ^{5}3,000	^{2}2,000	......	......	3,400	......	......
Total	**72,800**	**77,107**	**6,000**	......	**27,200**	**3,400**	**16,600**	......	......	**28,300**	**3,600**	**4,000**	......	**3,400**	......	......
NORTH DAKOTA																
Amoco Oil Co.—Mandan	**58,000**	**60,000**	......	......	^{1}**26,000**	**5,200**	^{4}**12,100**	......	......	^{2}**16,600**	^{2}**3,400** ***1,700**	^{6}**4,000**	......	......	......	......

OHIO

Company and location	– Crude capacity – b/cd	– Crude capacity – b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	— Cat cracking — Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Ashland Petroleum Co.—Canton	66,000	68,000	33,000	......	^{1}25,000	NR	^{5}20,000	......	^{3}23,000	^{1}20,000 ^{4}7,000 ^{7}6,500	^{2}7,000 *500	^{6}6,500	......	12,000	......	......
Sohio Oil Co. (BP America)—Lima	NR	180,000	51,000	^{5}16,200	^{1}36,000	7,800	^{4}53,000	^{4}23,000	......	^{1}59,000	......	^{1}24,400 ^{2}6,500 ^{6}16,600	2,100	......	......	620
Toledo	NR	127,000	49,000	^{5}13,700	^{1}55,000	None	^{3}23,000 ^{4}19,000	^{4}35,000	......	^{1}37,000	^{1}11,300	......	......	7,000	^{1}24.0	630
Sun Cl-Toledo[1]	125,000	133,000	22,000	......	^{1}60,000	1,200	^{2}41,000	^{1}28,000	......	^{1}27,500	^{1}7,800	^{1}8,500 ^{2}2,400	......	......	^{1}48.0	......
Total	**402,650**	**508,000**	**255,000**	**29,900**	**176,000**	**16,500**	**156,000**	**86,000**	**23,000**	**157,000**	**26,100**	**64,900**	**2,100**	**19,000**	**72.0**	**1,250**

Solvent extraction: [1]11,000 b/sd.

OKLAHOMA

Company and location	– Crude capacity – b/cd	– Crude capacity – b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	— Cat cracking — Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Barrett Refining Corp.—Thomas	13,000	NR	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Conoco Inc.—Ponca City	134,000	138,000	40,000	^{5}20,500	^{1}46,000	None	^{2}34,500	......	......	^{1}34,500 ^{5}24,000	^{2}12,000 *2,100	^{4}4,500	2,000	......	......	740
Kerr-McGee Refining Corp.—Wynnewood[1]	43,000	45,000	13,000	......	^{1}20,000	NR	^{2}8,500	^{1}5,000	......	^{1}9,000	^{2}5,000	^{6}4,000	......	5,000	^{1}10.0	......
Sinclair Oil Corp.—Tulsa	50,000	NR	15,000	......	^{1}18,000	5,000	^{2}12,000	......	......	^{1}12,000 ^{5}5,000	^{1}3,000	^{4}500 ^{6}6,000	......	2,500	......	......
Sun Cl—Tulsa[2]	85,000	90,000	31,500	......	^{1}28,000	840	^{2}23,000	......	......	^{1}24,000 ^{6}10,500	^{1}2,400 ^{2}6,000	^{1}2,000 ^{2}1,200 ^{3}1,500 ^{4}3,000	7,500	4,800	......	300
Total Petroleum Inc.—Ardmore	62,000	64,500	32,000	......	^{1}22,500	None	^{4}12,000	......	......	^{1}20,000	^{2}7,000	^{6}6,000	......	......	......	......
Total	**387,000**	**403,815**	**131,500**	**20,500**	**134,500**	**11,840**	**90,000**	**5,000**	......	**139,000**	**35,400**	**28,700**	**9,500**	**12,300**	**10.0**	**1,040**

Solvent extraction: [1]5,000 b/sd. [2]5,900 b/sd.

OREGON

Company and location	– Crude capacity – b/cd	– Crude capacity – b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	— Cat cracking — Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Chevron U.S.A. Inc.—Portland	**15,000**	**15,789**	**16,000**	......	......	......	......	......	......	......	......	......	......	**11,500**	......	......

PENNSYLVANIA

Company and location	– Crude capacity – b/cd	– Crude capacity – b/sd	Charge capacity, b/sd: Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	— Cat cracking — Recycle	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/sd: Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Atlantic Refining & Marketing Corp.—Philadelphia	125,000	130,000	83,000	......	^{1}29,000	None	^{2}60,000	^{4}30,000	......	^{1}50,000 ^{4}54,000 ^{7}24,000	......	......	......	25,000	^{5}40.0	......
Chevron U.S.A. Inc.—Philadelphia	174,100	180,000	80,000	......	^{1}73,300	6,500	^{2}34,000	......	......	^{2}34,000 ^{4}30,000	^{2}20,000	^{1}4,000 ^{2}1,300	......	......	......	......
Kendall-Amalie Division, Witco Chemical Co.—Bradford	9,900	10,500	......	......	......	......	^{2}3,400	......	......	^{1}3,600	......	......	4,000	......	......	......
Pennzoil Products Co.—Rouseville	15,700	16,500	6,500	......	......	......	^{2}5,820	......	......	^{1}6,500 ^{6}7,800	......	^{6}1,150	4,750	......	^{1}3.5	......
Quaker State Oil Refining Corp.—Smethport[1]	6,500	7,000	2,680	......	......	......	^{2}2,000	......	......	^{1}2,450	......	......	2,560	......	......	......
Sohio Oil Co. (BP America)—Marcus Hook	NR	180,000	75,000	......	^{1}50,000	1,600	^{6}48,000	^{4}21,000	^{3}50,000	^{1}64,000 ^{4}22,000 ^{5}22,000	^{2}9,000	......	......	......	......	......

Company and location	Crude capacity		Charge capacity, b/sd								Production capacity, b/sd					
	b/cd	b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Sun CI—Marcus Hook	165,000	185,000	46,000	......	[1]87,000	None	[2]39,600	......	......	[1]54,300 [4]14,400 [5]13,000 [6]6,000	[1]12,000	[1]7,000	10,000	......	......	......
United Refining Co.—Warren	60,000	62,000	26,000	......	[1]20,000	200	[2]16,000	......	......	[1]20,000 [4]6,000	[1]3,000 *2,200	[6]6,800	......	8,000	......	......
Total	**727,200**	**771,000**	**319,180**	......	**259,200**	**8,300**	**208,820**	**51,000**	**50,000**	**434,050**	**44,000**	**20,250**	**21,310**	**33,000**	**43.5**	......

Solvent extraction: [1]730 b/sd

TENNESSEE

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Mapco Petroleum Inc.—Memphis	NR	60,000	12,000	......	[1]30,000	None	[2]10,000	......	......	[1]10,000 [illegible],000 [5]16,000	[2]3,000 *2,500	[6]4,000	......	3,500	......	......
Total	**57,000**	**60,000**	**12,000**	......	**30,000**	......	**10,000**	......	......	**31,000**	**3,000**	**4,000**	......	**3,500**	......	......

TEXAS

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Amoco Oil Co.—Texas City	400,000	415,000	195,000	[5]38,000	[1]194,000	43,000	[4]160,000	[1]55,500 [2]60,000	[3]76,000	[1]126,000 [5]60,000	[1]19,000 [2]26,000	[1]45,000 [6]27,000	......	......	[1]180.0	2,050
Champlin Refining Co.—Corpus Christi[1]	150,000	155,000	80,000	[5]32,000	[1]70,000	None	[1]54,000	......	[3]55,000 [4]40,000	[1]54,000	[2]19,000 *1,700	5,000 [3]2,200	......	......	......	1,750
Chevron U.S.A. Inc.—El Paso	76,000	78,000	54,000	......	[1]22,000	None	[2]25,000	......	[4]18,000	[1]25,000	[1]5,500	[4]3,000	......	5,500	......	......
Port Arthur	406,900	412,000	203,200	[5]34,000	[1]110,000	6,000	[2]23,000 [4]44,100	......	......	[2]67 100 [4]138,000 [6]13,900	[2]16,900	[1]7,095 [2]2,905 2,500 [5]7,200	9,000	......	......	1,840
Coastal Refining & Marketing Inc.—Corpus Christi	90,000	95,000	45,000	[3]11,000 [5]12,000	[1]18,500	NR	[1]11,000 [5]18,000	[1]11,000	......	[1]32,000 [4]24,000 [5]25,000	[2]3,000	[1]9,000 [2]5,500 [6]5,200	......	5,000	[1]24.0 [3]24.0	650
Crown Central Petroleum Corp.—Houston	100,000	105,000	40,000	[5]12,500	[1]56,000	NR	[2]14,000 [5]22,000	......	[4]10,000	[1]26,000	[2]13,000	[1]2,000 [2]2,000	......	......	......	350
Diamond Shamrock Corp.—Sunray[2]	100,000	97,000	47,000	......	[1]45,000	None	[2]29,000	......	......	[1]33,000	[1]8,700 *4,600	[4]1,400	......	5,000	......	......
Three Rivers[3]	45,000	47,000	20,000	......	[1]19,000	None	[2]11,000	......	......	[1]11,000	[2]6,000	......	1,000	......	......	......
El Paso Refining CL—El Paso	21,000	21,000	......	[5]4,000	[1]7,000	2,000	[2]5,600	......	......	[1]5,600	[1]2,500 *500	[4]500	......	......	......	100
Exxon Co. U.S.A.—Baytown[4]	493,000	517,000	258,000	[4]28,000	[1]155,000	15,000	[3]60,000 [4]63,000	[1]19,000	[2]95,000	[1]139,000 [3]23,500 [4]143,000 [5]80,000 [6]44,100	[1]29,000	......	31,200	7,000	[1]85.0	100
Fina Oil & Chemical Co.—Big Spring[5]	55,000	60,000	22,000	[3]3,500	[1]22,000	None	[2]20,000	......	......	[1]22,000 [4]14,500 [5]3,000	[2]6,000	[1]650	......	6,500	......	......
Port Arthur[6]	90,000	110,000	40,000	......	[1]34,000	None	[5]30,000	......	[2]18,000 [3]13,000	[1]37,000 [5]28,000	[1]5,000	[1]10,000 [6]8,500	......	2,000	......	......
Hill Petroleum Co.—Houston[7]	67,500	70,000	27,000	[3]7,500	[1]50,000	NR	[2]13,500	......	......	[1]15,000 [4]22,500 [7]7,500	[1]5,500	[1]2,000	......	5,000	......	......
Howell Hydrocarbons Inc.—San Antonio	5,000	5,000	......	......	......	......	[1]1,000	......	......	......	......	[1]1,200	......	......	......	......
Koch Refining Co.—Corpus Christi	125,000	130,000	42,000	[5]12,000	[1]40,000	800	[1]12,000 [3]15,000	......	......	[1]28,000 [5]8,000	[2]8,400	[1]7,600 [2]2,500	......	......	......	375

	Crude capacity		Charge capacity, b/sd								Production capacity, b/sd					
					Cat cracking											
Company and location	b/cd	b/sd	Vacuum distillation	Thermal operations	Fresh feed	Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
LaGloria Oil & Gas Co.—Tyler	49,500	50,000	16,000	[5]6,000	[1]17,000	850	[2]4,500 [5]11,700	......	......	[2]20,800	[1]4,800	[6]5,000	......	......	......	250
Liquid Energy Corp.—Bridgeport	10,000	10,800	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Lyondell Petrochemical Co.—Houston[8]	255,000	296,000	133,300	[5]40,000	[1]90,000	None	[1]108,000	......	[3]48,000 [4]48,000 [5]37,000	[1]108,000 [3]8,000 [6]6,000 [7]800	[1]12,000	[1]11,000	12,800	......	......	12,800
Marathon Petroleum Co.—Texas City	69,500	72,000	27,000	......	[1]38,000	1,000	[1]9,000	......	......	......	[2]11,000	[1]2,500	......	......	......	......
Mobil Oil Corp.—Beaumont	275,000	290,000	86,000	[5]29,500	[1]102,000	None	[2]103,000	[1]32,000	......	[1]92,000 [6]3,500 [7]2,150 [7]116,000	[1]13,000	[5]20,000	8,300	......	[1]60.0	1,404
Phillips 66 Co.—Borger	105,000	110,000	......	......	[1]60,000	10,400	[2]26,000	......	[1]50,000 [4]40,000	[2]26,500	[2]14,000	[3]3,060 [4]8,100 [5]12,100 [6]12,500	......	......	[1]50.0	......
Sweeny	175,000	195,000	83,000	......	[1]87,000	12,000	[2]36,000	......	[1]75,000 [4]50,000	[2]53,000	[2]10,500	[1]5,575 [3]7,630 [5]9,100 [6]7,800	......	......	[4]80.0	......
Pride Refining Inc.—Abilene	42,750	45,000	12,500	......	......	......	......	......	......	......	......	......	......	......	......	......
Shell Oil Co.—Deer Park	214,000	225,000	89,000	[1]55,000 [6]18,000	[1]65,000	5,000	[2]20,000 [3]44,000	[4]65,000	[3]45,000	[2]65,000 [3]37,500 [6]11,500 [7]82,500	[1]8,100	[1]20,000	10,700	5,900	[1]65.0	......
Odessa	28,600	29,500	10,000	......	[1]10,500	NR	[1]11,000	......	......	[2]11,000	[1]3,300	[1]350	......	......	......	
Southwestern Refining Cl—Corpus Christi	104,000	108,000	36,000	......	[1]50,000	None	[2]30,000	......	[2]18,000	[1]40,000 [4]27,000	[2]4,000 *4,200	[1]6,500	......	......	......	......
Texaco Refining & Marketing Inc.—Port Arthur and Port Neches[9]	250,000	278,000	143,100	......	[1]110,000	31,500	[5]40,000	[1]1[illegible],000	......	[1]40,000 [4]80,000 [6]18,500	[1]9,000	......	17,400	14,000	......	......
Texas City Refining Inc.—Texas City	119,600	130,000	54,000	[3]19,000	[1]43,500	None	[2]11,000 [5]12,000	......	[4]29,000	[1]23,000	[2]6,200	......	......	......	......	......
Trifinery—Corpus Christi	28,500	30,000	20,000	......	......	......	......	......	......	......	......	......	......	10,000	......	......
Unocal Corp.—(Beaumnont), Nederland	120,000	126,300	43,000	......	[1]39,000	4,000	[3]12,000 [4]20,000	......	......	[1]32,000 [2]11,000 [3]10,600	[1]4,200 *1,400	[1]5,000 [3]1,200	3,100	2,500	......	......
Valero Refining Co.—Corpus Christi	NR	21,000	24,000	......	†54,000	2,700	......	......	[1]60,000	[7]10,500	[2]9,500 §2,900	......	......	10,000	[1]55.0	......
Total	**4,090,800**	**4,339,600**	**1,850,100**	**362,000**	**1,608,500**	**174,750**	**1,129,400**	**257,500**	**[illegible]25,000**	**2,192,550**	**286,000**	**297,365**	**93,500**	**78,400**	**623.0**	**21,669**

Solvent extraction: [1]12,000 b/sd. [2]15,000 b/sd. [3]7,000 b/sd. [4]53,000 b/sd. [5]10,000 b/sd. [6]18,000 b/sd. [7]11,000 b/sd. [8]10,200 b/sd. [9]4,000 b/sd.
†Heavy oil cracker. §Dimersol.

UTAH

Company and location	Crude capacity b/cd	Crude capacity b/sd	Vacuum distillation	Thermal operations	Cat cracking Fresh feed	Cat cracking Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Amoco Oil Co.—Salt Lake City	40,000	41,500	......	......	[1]18,000	4,000	[4]7,600	......	......	[1]7,600	[1]5,000	[4]3,000	......	......	......	......
Big West Oil Co.—Salt Lake City	24,000	24,000	3,850	......	[2]5,400	1,500	[2]5,000	......	......	[1]6,000	[2]1,400	......	......	......	......	......
Chevron U.S.A.—Salt Lake City	45,000	NR	35,500	[5]8,500	[1]11,000 [2]7,000	None 1,000	[2]5,500	......	[4]5,500	[1]5,500	[2]4,300	[4]7[illegible]0	......	......	......	350
Crysen Refining Inc.—Woods Cross	12,500	13,400	3,000	......	......	......	[2]3,000	......	......	......	......	......	......	......	......	......
Pennzoil Products Co.—Roosevelt	8,000	8,500	......	......	[1]6,000	500	[2]2,000	......	......	[4]2,000	*2,600	......	......	......	......	......
Phillips 66 Co.—Woods Cross[1]	25,000	26,000	3,200	......	[2]8,400	2,600	[2]6,000	......	[4]1,600	[2]11,000	[2]2,100	[6]2,600	......	1,700	......	......
Total	**154,500**	**180,768**	**45 550**	**8,500**	**55,800**	**9,600**	**29,100**	**......**	**7,100**	**32,100**	**12,800**	**6,350**	**......**	**1,700**	**......**	**350**

Solvent extraction: [1]5,000 b/sd.

Company and location	— Crude capacity — b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
			Charge capacity, b/sd								Production capacity, b/sd					
VIRGINIA																
Amoco Oil Co.—Yorktown	51,000	53,000	29,000	^{5}13,500	^{1}27,500	2,000	^{2}9,500	......	......	^{1}9,500 ^{5}15,500	*2,400	......	......	......	......	825
Total	**51,000**	**53,000**	**29,000**	**13,500**	**27,500**	**2,000**	**9,500**	......	......	**25,000**	......	......	......	......	......	**825**
WASHINGTON																
Atlantic Richfield Co.—Ferndale	162,000	170,000	95,000	^{5}50,000	......	......	^{2}56,000	^{1}52,000	^{4}18,000	^{1}38,000	......	......	......	......	^{1}80.0	2,500
Chevron U.S.A. Inc.—Seattle	5,500	NR	6,000	......	......	......	......	......	......	......	......	......	......	5,000	......	......
Mobil Oil Corp.—Ferndale	77,000	79,000	28,000	......	^{2}25,500	2,000	^{4}11,800	......	......	^{1}13,500 ^{4}15,000	^{2}5,900 *1,200	......	......	......	......	......
Shell Oil Co.—Anacortes	82,000	85,000	35,500	......	^{1}39,500	8,500	^{3}25,000	......	^{3}7,500	^{2}25,000 ^{5,7}20,000	^{1}10,900	^{4}2,750	......	......	......	......
Sound Refining Inc.—Tacoma	11,900	12,754	6,000	......	......	......	......	......	......	......	......	......	......	3,600	......	......
Texaco Refining & Marketing Inc.—Anacortes^{1}	87,000	90,000	30,000	^{5}18,000	^{1}35,000	9,000	^{2}21,000	......	......	^{1}21,000 ^{4}13,000 ^{5}10,000	^{1}6,600 *1,100	......	......	......	......	780
U.S. Oil & Refining Co.—Tacoma	NR	34,500	19,500	......	......	......	^{2}6,000	......	......	^{1}6,000 ^{4}4,000	......	......	......	8,000	......	......
Total	**458,175**	**477,043**	**220,000**	**68,000**	**100,000**	**19,500**	**119,800**	**52,000**	**25,500**	**165,500**	**23,400**	**2,750**	......	**16,600**	**80.0**	**3,280**

Solvent extraction: ^{1}5,000 b/sd.

Company and location	— Crude capacity — b/cd	b/sd	Vacuum distillation	Thermal operations	— Cat cracking — Fresh feed	Recycle	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
WEST VIRGINIA																
Quaker State Oil Refining Corp.—Newell	**10,500**	**10,800**	**8,850**	......	......	......	**^{2}3,400**	**^{3}4,500**	......	**^{2}3,900**	......	......	**4,440**	......	**^{1}1.2**	......
WISCONSIN																
Murphy Oil USA Inc.—Superior	32,000	34,000	20,500	......	^{1}9,700	1,000	^{2}8,000	......	......	^{1}9,000 ^{4}4,000 ^{5}2,000	^{2}1,200	^{6}2,000	......	13,500	......	......
Total	**32,000**	**34,000**	**20,500**	......	**9,700**	**1,000**	**8,000**	......	......	**15,000**	**1,200**	**2,000**	......	**13,500**	......	......
WYOMING																
Amoco Oil Co.—Casper	40,000	41,000	7,000	......	^{1}13,500	2,700	^{4}6,500	......	......	^{1}7,100	^{1}2,500	......	1,500	......	......	......
Frontier Oil & Refining Co.—Cheyenne	35,000	36,000	17,000	^{5}7,000	^{1}12,000	500	^{2}7,000	......	^{4}4,350	^{1}7,200	^{2}2,800	^{4}1,200	......	6,000	......	380
Little America Refining Co.—Casper	24,500	NR	8,600	......	^{1}12,500	None	^{2}6,100	......	......	^{1}5,000 ^{5}3,750	*1,500	......	......	......	......	......
Mountaineer Refining Cl—LaBarge	300	400	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Sinclair Oil Corp.—Sinclair	53,000	54,000	30,000	......	^{1}21,000	1,000	^{1}10,000	......	^{3}10,000	^{1}14,000 ^{4}12,000	^{1}4,000 *750	......	......	5,000	......	......
Wyoming Refining Co.—Newcastle	12,500	13,500	......	......	^{2}4,000	3,000	^{1}2,750	......	......	......	^{2}800	......	......	......	......	......
Total	**165,300**	**170,689**	**62,800**	**7,000**	**63,000**	**7,200**	**32,350**	......	**14,350**	**49,050**	**10,100**	**1,200**	**1,500**	**11,000**	......	**380**

Worldwide Construction

Ailleen Cantrell
Director of Editorial Surveys

Major construction projects in worldwide processing and pipelining, showing capacities, contractors, estimated costs, and time of completion. Total capacity figure in "Remarks & completion" column includes capacity of project listed. Where no such figure is given, project listed is a new unit.

Refineries—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

Company and location	Project	Capacity (b/d)	Remarks & completion
UNITED STATES			
Alaska Pacific Refining Inc.—Valdez	New ref	120,000	Eng-design: UOP. $700 MM. 1989.
Arco—Los Angeles, Cal.	Alky	5,000	14,000 total cap. Fluor Daniel. 1990.
Ashland Petroleum—Catlettsburg, Ky.	Lubes	600	8,500 total cap. Spring 1989.
*Citgo Petroleum—Lake Charles, La.	FCC	....	125,000 cat feed equivalent. Revamp C_4 recovery unit. Kellog. Fall 1988.
Conoco Inc.—			
Denver, Colo.	Cat reform	10,000	1989.
Ponca City, Okla.	Isom	7,500	1990.
*Marathon—Garyville, La.	ROSE	30,000	Kellogg. $25 MM. Late 1989.
Mobil Oil Corp.—			
Beaumont, Tex.	Cat reform	....	Upgrade and convert from semi bimcat to contin regen. $30 MM. mid 1989
Torrance, Calif.	Hydrorefine	68,000	Cat cracker-cycle stock pretreat. Kellogg. Late 1988.
Phillips 66—(Sweeny) Old Ocean, Tex.	hf alky	15,500	MW Kellogg. Const: HB Zachry. Mar. 1989.
Placid Refining—Port Allen, La.	hf alky	4,500	8,000 total cap. Olefin feed. 1989.
Tenneco Oil—Chalmette, La.	Crude	15,000	160,000 total cap. Bechtel. July 1989.
	FCC	4,000	Bechtel. July 1989.
*Texaco R&M—			
Convent, La.	Hydrogener.	20,000	C_3-C_4 selective. Eng: S&B. Spring 1989.
	Olef. split	20,000	C_3-C_4. Eng: S&B. Spring 1989.
	Dimersol	8,400	Eng: S&B. Spring 1989.
	Isom	12,500	Lic: Union Carbide. Mid 1989.
Port Arthur, Tex.	Alky	14,000	Fluor Daniel. Late 1989.
*Wilmington, Calif.	Hydrotreater	30,000	Eng. stage. Fluor Daniel. 1990.
Total Petroleum Inc.—			
Alma, Mich.	Hydrotreat	1,000	Dist. Nov. 1988.
Ardmore, Okla.	Polymeriz	2,500	Nov. 1988.
Arkansas City, Kans.	Hydrocrack	1,600	4,790 total cap. Dist. upgrade. Nov. 1988.
	Polymeriz	1,800	Nov. 1988.

REFINERIES — continued

Company and location	Project	Capacity (b/d)	Remarks & completion
*Union Pacific Resources—Wilmington, Calif.	Hydrotreater	35,000	Eng. stage. Fluor Daniel. 1990.
Unocal—Chicago, Ill.	Hydrotreat	8,000	22,200 total cap. Naph. desulf. Fluor Daniel. Dec. 1988.
	Isom	7,400	Lic: UC. Fluor Daniel. Dec. 1988.
U.S. Oil & Refining—Tacoma, Wash.	Hydrotreat	1,000	Naph. desulf. Nov. 1988.
	Isom	1,500	C_5-C_6 feed. Nov. 1988.
ARGENTINA			
Isaura SA—Bahia Blanca	Crude	12,000	24,000 total cap. Eng: Kellogg. Con: McKee. 1989 on all units.
	Vacuum	11,300	New. Kellogg. McKee.
	Visbreak	3,800	New. Kellogg. McKee.
	FCC	6,300	New. Kellogg. McKee.
AUSTRALIA			
*Ampol Refineries Ltd.—Brisbane, Queensland	Cat reform	19,000	32,000 total cap. Semi concat. 1991.
*Caltex Refining—Kurnell	FCC	....	Revamp. Con: Stone & Webster. $10.5 MM.
	Reformer	....	Revamp: Lic: UOP. Eng: Davy McKee. Under construction. late 1988.
Petroleum Refineries—Altona	Bitumen	....	Expan. Eng: Davy McKee. 1989.
Southern Cross Refiners Pty.—Port Banython	New ref	7,300	$20 MM. Includes: naph. hydrotreat, cat reform, isom, kero treat. End 1988.
BAHRAIN			
Bahrain Petroleum—Awali	Expan.	....	Eng. stage. Study: Bechtel. 1988.
BRAZIL			
Petrobras—			
North Eastern	New ref	124,000	Planning.
Araucária	Hydrocrack	28,400	Resid upgrade. Planning.
	Hydrotreat	28,400	Dist. Staff. 1991.
	Hydrogen	28.0 MMcfd	Fuel gas. Staff. 1991.
Betim, MG	Delay coke	14,200	Staff. 1990.
Canoas, RGS	Crude	108,600	Planning. Staff.
	Vac	54,300	Planning. Staff.
	Hydrotreat	28,400	SR Dist. Staff. 1991.
	Hydrogen	13.2 MMcfd	Fuel gas. Staff. 1991.
Cubatão, SP	Crude	120,600	Planning.
	Vacuum	60,300	Planning.
	Hydrotreat	18,600	SR dist. Staff. 1990.
	Hydrotreat	28,400	Dist. Staff. 1990.
	Hydrogen	16.5 MMcfd	Fuel gas. Staff. 1990
Duque de Caxias	Hydrotreat	28,400	Dist. Staff. 1991.
	Hydrotreat	31,200	SR dist. Staff. 1989.
Mataripe	Crude	94,700	217,100 total cap. Staff. 1990.
	Vac	69,300	106,100 total cap. Staff. 1990.
	Hydrocrack	39,800	Resid upgrade. Planning.
	Solvent extract	22,700	26,100 total cap. Planning.
	Hydrogen	22.3 MMcfd	23.4 total cap. Steam meth. reform. Planning.
Paulínia	Delay coke	14,200	Staff. 1990.
	Delay coke	14,200	Planning.
	FCC	40,000	82,500 total cap. Under const. Lic: Kellogg. Eng: Promon. 1989.
	Hydrocrack	28,400	Resid upgrade. Staff. 1991.
	Hydrotreat	56,900	Dist. Staff. 1991.
	Hydrogen	31.9 MMcfd	Fuel gas. Staff. 1991.
São José dos Campos	Solvent extract	27,300	Eng: Ultratec. Staff. 1998.
CANADA			
Husky Oil Operations Ltd.—Lloydminister	Heavy oil	54,000	Hydrocracker (HRI) and delayed coker (FW). $1.2 billion. Completion: 1992.
*Prince George	Cat poly	1,000	UOP condensation unit. Duckworth, Price, Henderson Engs. 1989.
*Petro-Canada—			
Clarkson, Ont.	Isom	....	Stone & Webster.
Fort McMurray	Crude	70,000	$4 billion. Planned.
CHILE			
Refineria de Petroleo Concon—Concon	Hydrocrack	7,700	June 1990.
CHINA			
*Erlian, Inner Mongolia	New ref	20,000	1991.
Guangzhou Petrochemical Corp.—Huang Pu, Guangdong	Visbreak	20,000	Shell Soak. Lummus Crest BV. Early 1989.
	FCC	25,000	Resid. Eng stage. Lic: Stone & Webster. 1988.
Sinopec—Changling	FCC	25,000	Resid. Eng. stage. Lic: Stone & Webster. 1988.
Fushun, Liaoning	Alky	2,010	Stratco tech. Turnkey: Bechtel. 1989.
Gao Qiao	Hydrotreat	1,000	Paraffin wax. Technip. 1989.
*Huang Pu	HDT-reform	40,200	CTIP.
	Demex	16,000	Vac resid. Design: UOP.
Nanjing	FCC	25,000	Resid. Eng. stage. Lic: Stone & Webster. 1988.
Shengli, Shandong	Alky	1,206	Stratco tech. Turnkey: Bechtel. 1989.
Qi-Lu, Shandong	Hydrotreat	....	Eng. Lummus Crest. 1988.
Yangzi Petrochemical Nanjing	Therm crack	20,422	Chiyoda. 1988.
Yanshan Petrochemical Corp.—Yanshan, Beijing	Visbreak	20,000	Shell Soak. Lummus Crest BV. Early 1989.
CHINA, TAIWAN			
Chinese Petroleum Corp.—Kaohsiung	Cat reform	55,000	95,000 total cap. Semi bimcat. Mid 1992.
	Resid HDS	30,000	JGC. Mid 1990.
	hf Alky	2,500	Mid 1992.
	Dimersol	500	Mid 1992.
	Hydrogen	35.0 MMcfd	Steam meth. reform. Mid 1990
Ta Lin Pu	Resid crack	25,000	Eng. Kellogg. 1990.
	Hydrogen	35.0 MMcfd	Steam meth. reform. Mid 1990.
Tao-yuan	Resid HDS	15,000	45,000 total cap. Chiyoda. Mid 1990.
	Hydroref	11,000	26,000 total cap. Mid dist. Mid 1991.
	Hydrogen	17.0 MMcfd	67.0 total cap. Steam meth. reform expan. Eng: Chiyoda. Mid 1990.

REFINERIES — continued

Company and location	Project	Capacity (b/d)	Remarks & completion
COLOMBIA			
Ecopetrol—Barrancabermeja	Crude	2,000	170,000 total cap. 1990.
COSTA RICA			
Recope—Limon	Crude	4,000	20,200 total cap. Dec. 1988.
	Vac	800	1,400 total cap. Dec. 1988.
	Asphalt	400	700 total cap.
CZECHOSLOVAKIA			
Bratislava	Hydrocrack	1[illegible],000	Eng. Snamprogetti. 1989.
Litvinov, Bohemia	Vac	30,000	Snamprogetti. 1988.
EGYPT			
Alexandria Petroleum.—(El-Mex) Alexandria	Crude	42,500	141,750 total cap. Planning.
Assiout Oil Refining.—Assiout	New ref	86,000	2 stages. Bechtel GB. $350 MM. 1989-2nd stage
Cairo Oil Refining.—Mostorod	Crude	39,700	164,760 total cap. Planning.
El Ameria Oil Refining—El Ameria	Crude	42,500	102,840 total cap. Planning
FRANCE			
Elf France—Donges	FCC	5,740	41,640 total cap. 1988.
*Esso SAF—Port Jerome	FCC	4,000	24,000 total cap. Late 1989.
GERMANY, EAST			
VE AHB Indus	Resio cracker	11,006	Under const. TEC. 1988.
GERMANY, WEST			
Deutsche Shell—Godorf	Hydroconversion	....	Revamp. Edeleanu. Eng. 1988.
Deutsche Texaco—Grasbrook	Revamp	....	Lube base oil. Lic: Texaco. Eng: Edeleanu. Late 1988.
Ruhr Oel—Gelsenkirchen	Asphalt	960	5,800 total cap. Fluor. 1988.
GREECE			
Hellenic Aspropyrgos Refinery—Aspropyrgos	Hydrotreat	9,500	31,500 total cap. Eviesk. Sept. 1989.
	Hydroref	9,700	Gas oil desulf. 25,300 total cap. Planned.
	Isom	7,000	C_5-C_6 feed. Eviesk. Sept. 1989.
Motor Oil Hellas—Corinth	Hyorotreat	17,000	Revamp. Total cap. Technipetrol. Aug. 1989.
	Reformer	12,300	Revamp. Total cap. Technipetrol. Aug. 1989.
HUNGARY			
*Dunai Kolajipari Vallalat—Szazhalombatta	Platformer	13,920	CCR tech. UOP process.
INDIA			
Cochin Refineries Ltd.—Ambalamugal	Cat reform	5,980	Semi bimcat. EIL over all. Feb. 1989 on all units.
	Hydrotreat	5,980	Feed pretreat.
	Arom	1,940	BTX.
Hindustan Petroleum Corp.—Mangalore	New ref	60,000	Proposed. $225 MM. Birlas 27%, Hindustan 26%.
Tata-Indianoil Refineries Ltd.—Baholi, (sw of Karnal)	New ref	120,493	$1.1 billion.
IRAN			
NIOC—Bandar Abbas (Strait of Hormuz)	New ref	220,000	
Arak	New ref	200,000	Planned.
Esfahan	Lube complex	3,618	Eng. stage. FW Italiana.
IRAQ			
Oil Refineries Administration	New ref	150,000	Technical studies under way.
ITALY			
AGIP—Sannazzaro	Vac	21,700	86,200 total cap. Snamprogetti on all units. 1989.
	Visbreak	27,800	1989
	Isom	9,100	C_5-C_6 feed. Union Carbide. Fall 1988.
	Hydrogen	2.8 MMcfd	PSA. Fall 1988.
Taranto	Isom	3,900	C_5-C_6 feed. Snamprogetti. 1989.
Venezia	Cat reform	15,000	Revamp. IFP, TPL. Dec. 1988.
	Visbreak-therm crack	24,600	Snamprogetti. 1989.
Esso Italiana—Augusta	Cat reform	11,100	19,100 total cap. Semi bimcat. 1991.
	Hydrotreat	4,200	18,200 total cap. Feed pretreat. 1991.
	Hydrotreat	9,400	35,200 total cap. SR dist. 1989.
*ICIP—Mantova	Hydrotreat	3,000	Dewax. Planned. 1990.
Mediterranea—Milazzo	Hydroref	14,500	Mid dist. 1989.
*Saras—Sarroch	Visbreak	23,000	50,000 total cap. Dec. 1989.
	FCC	6,000	69,000 total cap. Feb. 1989.
Soc. Energia Montedison—Priolo	Alky	3,700	Stratco tech. June 1989.
Stanic—Livorno	Cat reform	9,000	Cyclic bimcat. UOP. Snamprogetti. 1988.
Tamoil—Cremona	Hydrocrack	5,500	Dewax. Design: BP. Planned. End 1988.
	Hydrogen	3.6 MMcfd	Planned. End 1988.
JAPAN			
*Kashima CL—Kashima	Hydroref	20,000	55,000 total cap. JGC. Oct. 1989.
*Maruzen Petrochemical—Chiba	Hydrodealky	2,900	Eng. stage. Design: HRI. 1989.
KOREA			
Kukdong Oil CL—Daesan	Crude	60,000	Badger and Hyundai. Late 1988 on all units.
	Vac	34,000	Badger.
	Delay coke	19,000	Badger.
	Cat reform	3,000	Semi bimcat. Badger, Hundai.
	Hydrocrack	22,000	Dist. upgrade. Badger.
	Hydrotreat	6,000	Naph desulf. Badger & Hyundai.
	Hydrotreat	11,000	SR dist. Badger & Hyundai.
	Hydrotreat	2,000	LPG merox. Badger & Hydundai.
	Hydrotreat	7,000	Kero. merox. Badger & Hyundai.
	Hydrogen	54.0 MMcfd	Steam naph. reform. Badger.
	Coke	1,094	Badger.
Yukong Ltd.—Ulsan	Vac	45,000	89,000 total cap.
	Reform	22,500	41,400 total cap. CCR.
	Hydrocrack	27,000	
	Hydroref	27,000	Resid desulf.
	Hydrotreat	22,500	61,400 total cap. Feed pretreat.

REFINERIES — continued

Company and location	Project	Capacity (b/d)	Remarks & completion
	Hydrotreat	9,000	19,500 total cap. SR dist.
	Aromatics	880	1,680 total cap. Cyclohexane.
	Hydrogen	50 MMcfd	Steam naph reform.

KUWAIT

Company and location	Project	Capacity (b/d)	Remarks & completion
Kuwait National Petroleum—Mina Abdulla	Crude	156,250	KSF Braun overall contractor. End 1988.
	Vacuum	127,000	Lic: KSFB.
	Hydrotreat	65,900	Resid. Lic: Union.
	Hydrotreat	7,500	Naph. Lic: IFP.
	Hydrotreat	35,000	Kero. Lic: IFP.
	Hydrotreat	35,000	Diesel. Lic: IFP.
	Naph. Merox	3,200	Lic: UOP.
	Hydrocrack	38,000	Lic: Chevron.
	Delay coke	60,000	Lic: KSFB.
	Hydrogen	144 MMcfd	Lic: FWEC.
	Hydrogen recovery	24 MMcfd	Lic: Linde.
Mina Al-Ahmadi	Alky	4,500	Stratco. All units planned. End 1992 over all.
	FCC	10,840	LPG treater. JGC.
	FCC	10,840	LPG merox. UOP process.

MALAYSIA

Company and location	Project	Capacity (b/d)	Remarks & completion
Petroliam Nasional Bhd.—Tanjung Kling, Malacca	New ref.	100,000	Feasibility study revived.

MEXICO

Company and location	Project	Capacity (b/d)	Remarks & completion
Petroleos Mexicanos:			
Cadereyta, Nuevo Leon	Visbreak	50,000	Eng. stage. 1989
Lazaro Cardenas, Mich.	New ref	200,000	Planned.
	Vacuum	120,000	
	Cat reform	40,000	
	Hydrotreat	40,000	Cat feed pretreat.
	Hydrotreat	16,000	Naphtha desulf.
	Hydrotreat	50,000	Distillates.
Minatitlan	Visbreak	50,000	Eng. stage. Staff. 1989.
*Salamanca, Gto.	Furfural	4,000	Under const.
	Lubes	3,500	Under const. 1989
Salina Cruz	Crude	165,000	Under const. Staff. 1989.
	Vac	80,000	Under const. Staff. 1989.
	FCC	40,000	Eng. stage. Staff. 1990.
	Cat reform	30,000	Cyclic bimcat. Naph. Eng. stage. Staff. 1989.
	Hydrotreat	86,000	Total capacity 3 units. Eng. stage. Staff. 1989.
	Hydrodesulf	36,000	Naph. Eng. stage. 1990.
	Hydrodesulf	50,000	Mid dist. 2 units. Eng. stage. 1990.
*Tula	Hydrodesulf	≤36,000	Naph. Eng. stage. 1989.
	Hydrodesulf	50,000	Mid dist. 2 units. Eng. stage. 1989.
Cat reform		30,000	Semi bimcat. Naph. Eng. stage. 1989.

NETHERLANDS

Company and location	Project	Capacity (b/d)	Remarks & completion
Shell Internationale Petr.—Pernis, Rotterdam	Modernize	....	$750 MM over all. Includes Hycon unit (hydrogen conversion), and desulfurizers. Contractor: Lummus Crest BV. Completion: 1988.
Kuwait Petroleum Europoort BV—Rotterdam	Cat reform	19,000	Braun. 1989.
	Hydrotreat	24,130	Braun. 1989.
	Isom	5,890	C_5-C_6 feed. Braun. 1989.
	Hydrogen	2.0 MMcfd	Braun. 1989.

NIGERIA

Company and location	Project	Capacity (b/d)	Remarks & completion
Nigerian National Petroleum Corp.—			
Kaduna	Merox	6,000	$14.3 MM.
Port Harcourt	Hydrotreat	7,500	Naph desulf. Planned.
Port Harcourt	New ref	150,000	JGC over all. Marubeni, Spie-
	Vac	53,760	Batignolles. Nov. 1988 on all
	FCC	40,000	units.
	Reformer	33,000	UOP. Naph desulf.
	Polymeriz	4,850	IFP C_3. Dimersol.
	Hydrotreat	33,000	UOP. Naphtha
	Hydrotreat	14,500	IFP. Kerosine
	hf alky	7,000	UOP.
	Treater	11,400	Merox.
	Treater	24,000	Merox.
	Isomerizer	3,600	UOP butamer.

NORWAY

Company and location	Project	Capacity (b/d)	Remarks & completion
Rafinor A/S—Mongstad	Crude	55,000	145,000 total cap. $650 MM. Con: Foster Wheeler-Linde. Mar. 1989.
	FCC	41,000	Eng: UOP. Con: Linde. June 1989.
	Cat reform	16,000	Contin conven. UOP-Linde. May 1989
	Hydrotreat	16,000	26,000 total cap. Naphtha desulf. UOP lic. Con: Linde. May 1989.
	Hydrotreat	9,000	25,000 total cap. Distillates. Union lic. Con: Unocal-Linde. June 1989.
	Cat poly	12,000	Con: UOP-Linde. June 1989

PERU

Company and location	Project	Capacity (b/d)	Remarks & completion
Petroleos del Peru—Talara	Crude	13,000	75,000 total cap. 1989.
	Vac	4,200	28,200 total cap. 1989.
	FCC	4,400	21,000 total cap. 1989.

PHILIPPINES

Company and location	Project	Capacity (b/d)	Remarks & completion
*Bataan Refining Corp.—Bataan	Vac dist.	16,000	Expan. JGC. 1989.

PUERTO RICO

Company and location	Project	Capacity (b/d)	Remarks & completion
Sun Oil—Yabucoa	Reform	20,000	Semi bimcat. $45 MM. Litwin. Mar. 1989.

QATAR

Company and location	Project	Capacity (b/d)	Remarks & completion
National Oil Distributioin.—Umm Said	Isom	6,600	Penex-Molex. Eng. stage. 1989.
	Crude	1,200	62,000 total cap. Revamp hydrotreaters, Platformer-(concat regen), gas treater, LPG recover. Design: UOP. 1989.

SAUDI ARABIA

Company and location	Project	Capacity (b/d)	Remarks & completion
Petromin-Mobil—Yanbu	Lubes	4,109	$160 MM. Plans revived.
Petromin-Shell—Al Jubail	Merox	11,600	UOP Equitec Services will build.

SINGAPORE

Company and location	Project	Capacity (b/d)	Remarks & completion
Mobil Oil Singapore—Jurong	Hydrocrack	23,000	$80 MM both units.
	Isom-dewax	12,000	
Shell Eastern Petroleum—Pulau Bukom	Cat cracker	....	Chiyoda. 1990.
	Alky	....	Chiyoda. 1990.

SPAIN

Company and location	Project	Capacity (b/d)	Remarks & completion
*Petroleos del Mediterraneo—Castellon de la Plana	Cat crack	10,000	25,000 total cap. $15 MM. Early 1990.

REFINIERIES -- continued

Company and location	Project	Capacity (b/d)	Remarks & completion
Petronor—Bilbao	Modernize	....	$90MM.
Repsol Petroleo—Puertollano	Delay coke	15,000	Foster Wheeler. 1989.
	Hydroref	10,000	LCO-LCGO. 1989.
	Coke	750 t/d	Foster Wheeler. 1989.
	Hydrogen recover	....	FCC and delay coke. Indein. June 1989.

SWEDEN

Company and location	Project	Capacity (b/d)	Remarks & completion
*Skandinaviska Raff. Scanraff—Lysekil	Crude-vac	....	Revamp. [illegible] 1988.
	FCC	....	Eng: Foster Wheeler. 1991.

SYRIA

Company and location	Project	Capacity (b/d)	Remarks & completion
*Banias Refinery.—Banias	Isom	8,000	C_5-C_6 feed. End 1989.

THAILAND

Company and location	Project	Capacity (b/d)	Remarks & completion
Bangchak Petroleum—Bangkok	Expan	20,000	65,000 total cap. TEC. 1989.
Esso Standard Thailand—Cholburi	Crude	37,000	100,000 total cap. $200 MM. Planned.
Thai Oil CL—Sriracha	Crude	12,600	76,460 total cap. Foster Wheeler and Chiyoda. 1989 on all units.
	Vac	29,800	50,300 total cap.
	Visbreak	7,400	19,900 total cap.
	Cat reform	2,300	7,600 total cap. Semi bimcat.
	Hydrocrack	15,400	Dist upgrade.
	Hydrogen	28.0 MMcfd	Steam meth reform.

TURKEY

Company and location	Project	Capacity (b/d)	Remarks & completion
Turkish Petroleum Refin.—Kirikkale, Ankara—	Hydrocrack	14,000	Lic. UOP. 1990.
	Hydrogen	19.0 MMcfd	1990.

UNITED KINGDOM

Company and location	Project	Capacity (b/d)	Remarks & completion
BP Oil Grangemouth Ref. Ltd.—Grangemouth	Upgrade	....	$69 MM. Foster Wheeler on cat cracker, cat reform. Wimpey and Honeywell on tech. New hydrogen-LPG units. Costain Petrocarbon. 1989.
*Conoco Ltd.—South Killinghome	hf Alky	9,500	Matthew Hall, Conoco Staff. May 1989.
	Isom	6,500	C_4 feed. Matthew Hall, Conoco Staff. May 1989.
*Eastham Refinery Ltd.—Ellesmere Port	Crude	18,000	Expan.
	Vacuum	15,750	
	SR asphalt	12,000	
*Esso Petroleum—Fawley	Ref expan.	....	£50 MM. Upgrade. Wimpey Eng.
Gulf Oil Refining Ltd.—Milford Haven	Revamp	....	Hydrotreater. Feasibility: Matthew Hall.
Mobil Oil—Coryton	Reform	33,000	Concat. $108 MM. MW Kellogg. Late 1989.
Sheil UK Oil—Stanlow	HF alky	....	Upgrade. Eng: Fluor Daniel. 1989.

U.S.S.R.

Company and location	Project	Capacity (b/d)	Remarks & completion
Omsk	Gaso feed fraction	51,107	Technip over all.
	Hydrodesulf	21,925	Eng: Litwin.
Ufa	Gaso feed fraction	51,107	Technip over all.
	HDA	21,925	Eng: Litwin.

VENEZUELA

Company and location	Project	Capacity (b/d)	Remarks & completion
*Corpoven—El Palito	Cat reform	2,500	Expan-revamp. BTX units. Lic: UOP: Con: Kellogg and Inelectra. 1990.
	Cat crack	12,000	Revamp. Lic: UOP. 1989.
	Hydrogen	13.7 MMcfd	Design: Linde. Eng: 1989.
*Puerto La Cruz	Hydrotreat	70,000	Lic: IFP-Total. Eng: Badger. Con: Inelectra. Eng. stage. 1991.
Lagoven—Amuay	Delay coke	16,000	$100 MM. Eng. stage. Foster Wheeler. 1990.
	Flexicoke	14,000	65,000 total cap. Eng. stage. Revamp. Lic: UOP. Ereco-Vepica. $24.1 MM. 1990.
*Maraven—Cardón	Crude-vac	134,139	Revamp. Lic: UOP. Eng: Inelectra and Kellogg. $48 MM. 1989.

YUGOSLAVIA

Company and location	Project	Capacity (b/d)	Remarks & completion
Rafin. Nafte Pančevo—Pančevo	Cat reform	17,800	Semi bimcat. UOP. 1995.
	Hydrotreat	25,500	34,300 total cap. UOP. 1995.
	Arom-BT	215	2,815 total cap. UOP. 1990.

ZAMBIA

Company and location	Project	Capacity (b/d)	Remarks & completion
Indeni Petroleum Refinery CL—Bwana Mkubwa	Vac	3,000	UOP
	Hydrotreat	4,800	Dist. upgrade. UOP

Petrochemicals—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

***AMOCO CHEMICAL. Chocolate Bayou.** Ethylene expansion in engineering stage. Contractor: Braun. Completion: 1989.

***Texas City, Tex.** Toluene unit in engineering stage. Eng-design: Fish. Completion: 1988.

Cooper River plant, Charleston, S.C. 100 MM lb/y expansion of terephthalic acid. Completion: 1989.

ARCO CHEMICAL. Channelview, Tex. 75 MM lb/y 1,4-butanediol unit in engineering stage. Eng: Badger. Tech: Arco and Kuraray. Completion: end 1989.

Los Angeles, Calif. 2,000 b/d MTBE unit under construction. Eng: Fluor Daniel. Completion: 1990.

***ARISTECH CHEMICAL CORP. Haverhill, Ohio.** 9,072 mt/y phenol, 5,625 mt/y acetone expansion. Feed: cumene. Completion: Dec. 1988.

16,329 mt/y bisphenol A expansion. Feed: phenol-acetone. Completion: Early 1989.

***ASHLAND PETROLEUM. Catlettsburg, Ky.** 900 b/d (4,300 b/d total cap.) cumene expansion. Completion: Summer 1989.

***BORG-WARNER CHEMICALS. Carville, La.** 200 MM lb/y styrene expansion. Feed: benzene, ethylene. 1,500 gal/y toluene expansion. Planned. Contractor: Badger. Completion: July 1989. (Joint venture: Fina Oil & Chemical share, 200 MM lb/y, Borg-Warner share 200 MM lb/y, 400 MM total capacity).

Geismar, La. Phase I: 4,000 lb/y ethylene expansion. Feed: ethane, propane. 200 lb/y propylene expansion. Planned. Completion: July 1989.

Phase II: 30,000 lb/y ethylene expansion. Feed: ethane, propane. 1,500 lb/y propylene. Planned. Completion: Early 1991.

***BP CHEMICALS AMERICA. Green Lake, Tex.** 160,000 lb/y acrylonitrile expansion. Feed: propylene, ammonia. Completion: 1988-1990.

Lima, Ohio. 40,000 lb/y acrylonitrile expansion. Feed: propylene, ammonia. Completion: 1988-1990.

***CAIN CHEMICAL CO. Matagorda, Tex.** 185,000 mt/y hd polyethylene expansion. Feed: ethylene. Planned. Completion: Spring 1990.

95,000 mt/y hd polyethylene expansion under construction. Feed: ethylene. Completion: early 1989.

CAROLINA EASTMAN. Columbia, SC. 300 t/d polyethylene terephthalate expansion under construction. $80 MM. Eng: Bechtel. Contractor: Becon. Completion: Nov. 1988.

CERTAINTEED CORP. Lake Charles, La. 35 MM lb polyvinyl chloride expansion under construction. Feed: vinyl chloride. Contractor: Jacobs. Completion: mid 1989.

***CHAMPLIN REFINING. Corpus Christi, Tex.** 113,000 mt/y cumene expansion in engineering stage. Feed: propylene. Contractor: Litwin. Completion: Sept. 1989.

CHEVRON CHEMICAL. Baytown, Tex. 90,700 mt/y alphaolefins expansion. Feed: ethylene. $6.8 MM. Contractor: Brown & Root. Completion: 1990.

59,000 mt/y propylene expansion. $85 MM. Contractor: Becon. Completion: late 1988.

200,000 mt/y lld polyethylene expansion. Feed: ethylene. Planned.

***Cedar Bayou, Tex.** 440 MM lb/y polyethylene unit in engineering stage. Contractor: Fluor Daniel. Completion: 1990.

*Ethylene unit in engineering stage. Eng-design: Fish. Completion: 1989.

91,000 mt/y alphaolefins unit under construction. $50 MM. Contractor: Becon. Eng: Bechtel. Completion: 1990.

***Port Arthur, Tex.** 180 MM lb/y propylene expansion. Completion: 1989.

***St. James, La.** 900 MM lb/y ethylbenzene-styrene expansion in engineering stage. Contractors: Brown & Root, Badger Engineers. Mobil-Badger and Fina-Badger technology. $125 MM. Completion: 1990.

CONOCO INC. Lake Charles, La. 1,900 b/d MTBE unit. Completion: 1990.

***DOW CHEMICAL. Freeport, Tex.** 1.5 billion lb/y ethylene expansion in engineering stage. Contractor: Braun. Construction start: Spring 1989. Completion: 1991.

EL PASO PRODUCTS. Bayport, Tex. 140,000 mt/y polypropylene unit planned. Feed: propylene. Completion: 1990.

EMERY CHEMICAL. Cincinnati, Ohio. Solvents plant under construction. $2 MM. Eng: Badger. Manage: Zachry. Completion: Dec. 1988.

EXXON CHEMICAL AMERICAS. Baytown, Tex. Polypropylene unit under construction. Eng: SIP. Contractor: Zachry. $20 MM. Completion: Dec. 1988.

FINA OIL & CHEMICAL. LaPorte, Tex. 113,400 mt/y polypropylene expansion. Feed: ethylene-propylene. Contractor: Fluor Daniel. Completion: end 1988.

***GEORGIA GULF CORP. Atlanta.** 110 MM lb/y polyvinyl chloride expansion (810 MM total cap). $15 MM. Completion: late 1989.

GOODYEAR TIRE & RUBBER. West Point, Va. 58,000 mt/y polyethylene terephthalate unit under construction. $50 MM. Contractor: John Brown. Completion: early 1989.

HUBINGER (HJ Heinz Co.). **Keokuk, Iowa.** 11 MM gal/y ethanol unit. $14.9 MM. Completion: early 1989

***MARATHON PETROLEUM. Garyville, La.** 1,174 b/d MTBE unit under construction. Lic: Arco. Contractor: Fluor. Completion: July 1989.

MELAMINE CHEMICALS INC. Donaldsonville, La. 13,600 mt/y melamine expansion. Feed: urea. Contractor: Xytel, Bechtel. Completion: Dec. 1988.

***OCCIDENTAL CHEMICAL. Corpus Christi, Tex.** 363,000 mt/y ethylene dichloride unit under construction. Feed: ethylene-chlorine. $40 MM. Eng: Bechtel. Contractor: Becon. Completion: Spring 1989.

1,000 MM lb/y vinyl chloride unit in design-engineering stage. $200 MM. Eng: Bechtel. Completion: 1991.

Deer Park, Tex. 69,000 mt/y vinyl chloride expansion under construction. Feed: ethylene, chlorine. Completion: end 1988.

Lake Charles, La. 100 MM lb/y ethylene expansion (650,000 total cap.). Eng-design: Braun. Completion: Jan. 1990.

Pasadena, Tex. 91,000 mt/y polyvinyl chloride expansion. Feed: vinyl chloride. Planned. Completion: Fall 1990.

***POLYSAR LTD. Orange, Tex.** 1,600 mt/y nitrile rubber unit. Feed: acrylonitrile, butadiene. Contractor: Fluor Daniel. Completion: end 1988.

ROHM & HAAS. Deer Park, Tex. Acrylic acid expansion under construction. Eng: Bechtel. Completion: 1989.

***PHILLIPS 66. Houston, Tex.** 275 MM lb/y hd polyethylene expansion (1.8 billion total cap.). Completion: 1990.

Pasadena, Tex. 40,800 mt/y resins expansion under construction. Feed: butadiene, styrene. Eng: Kellogg. Completion: Aug. 1989.

Sweeny, Tex. 680,000 mt/y ethylene expansion planned. Feed: ethane, propane. Eng study: Santa Fe Braun. Completion: late 1990.

*34,000 mt/y ethylene expansion under construction. Feed: ethane, propane. Contractor: Santa Fe Braun. Completion: Spring 1989.

*275 MM lb/y hd polyethylene expansion. Eng: MW Kellogg. Completion: Spring 1990.

***QUANTUM—USI DIVISION. Clinton, Iowa.** 18,000 mt/y hd polyethylene expansion. Feed: ethylene. Completion: mid 1989.

68,000 mt/y ethylene expansion. Feed: ethane, propane. Completion: 1989.

45,000 mt/y additional ethylene expansion in 1991.

Deer Park, Tex. 680,000 mt/y ethylene unit. Feed: LPG. Completion: early 1991.

91,000 mt/y hd polyethylene unit. Feed: ethylene. Completion: early 1990.

52,000 mt/y hd polyethylene expansion. Feed: ethylene. Completion: mid 1989.

*408,348 mt/y acetic acid expansion in engineering stage. Contractor: Braun. Completion: 1989.

*20 MM gal/y polyalphaolefins unit, 3 MM gal/y polyalphaolefins expansion under construction. Eng: Fluor Daniel. Completion: 1989.

Morris, Ill. 23,000 mt/y lld polyethylene expansion. Feed: ethane, propane, butane. Completion: 1989.

66,000 mt/y polypropylene expansion. Feed: ethane, propane, butane. Completion: 1989-1992.

80,000 mt/y ethylene expansion. Feed: ethane, propane, butane. Eng: Lummus. Contractor: Braun. Completion: 1989-1991.

Port Arthur, Tex. 18,000 mt/y hd polyethylene expansion. Feed: ethylene. Completion: mid 1989.

***SHELL CHEMICAL. Deer Park, Tex.** 250 MM lb/y bisphenol A unit in engineering stage. $60 MM. Eng: Bechtel. Contractor: Becon. Completion: Nov. 1989.

Geismar, La. 243,000 mt/y linear higher olefins expansion under construction. Feed: ethylene. Shell process. $90 MM. Contractors: Bechtel and Becon Const. Completion: early 1989.

STANDARD OIL CHEMICAL. Green Lake, Tex. 23,000-95,000 mt/y maleic anhydride, 31,000 mt/y butanediol, 27,000 mt/y gamma-butyrolacetone, 11,000 mt/y tetrahydrofuran. Feed: n-butane. Planned. Completion: 1990.

***STERLING CHEMICAL. Texas City, Tex.** 248 MM lb/y acrylonitrile expansion under construction. Contractor: Fluor Daniel. Completion: 1989.

TEXAS EASTMAN. Longview, Tex. 110,000 mt/y polypropylene expansion under construction. Feed: propylene. Completion: Feb. 1989.

ALGERIA

***ENTERPRISE NATIONALE DE LA PETROCHIMIE. Skikda.** 50,000 mt/y linear alkylbenzene intermediates. UOP process. $80 MM.

ARGENTINA

DUPERIAL SAIC. San Lorenzo. 4,600 mt/y phthalic anhydride expansion planned. (17,000 mt/y total cap.) Feed: orthoxylene. Eng: Davy Powergas. Contractor: Duperial. Completion: 1989.

ELECTROCLOR SAIC. Bahía Blanca. 41,500 mt/y polyvinyl chloride plant. Feed: vinyl chloride. $86.6 MM. Contractor: McKee. Completion: mid 1989.

***IPAKO (51%) and SHELL ARGENTINA (49%). Ensenada, BA.** 100,000 mt/y polypropylene unit planned. Shell Lipp/Shac tech. $110 MM. Completion: 1990.

MALEIC SA. Ensenada. 8,000 mt/y maleic anhydride unit in engineering stage. Design: Scientific Design. Completion: 1989.

PETROQUÍMICA GENERAL MOSCONI. Ensenada. 45,000 mt/y dimethyl terephthalate unit under construction. Feed: paraxylene. Eng: Krupp Koppers. Completion: 1991.

35,000 mt/y oxoalcohols unit under construction. 40,000 mt/y MTBE. 25,000 mt/y 1-butene. 25,000 mt/y methanol. Feed: LPG. Contractor: Techint. Completion: 1989.

***POLITENO. Camaçari.** 130,000 mt/y polyethylene expansion. Feed: ethylene. Lic: DuPont. Completion: 1991.

AUSTRALIA

***ALTONA PETROCHEMICAL CL. Altona.** 20,000 mt/y ethylene expansion. Feed: gas oil. Exxon tech. $22 MM-Aust. Contractor: Foster Wheeler, Shedden Pacific Pipe Line. Completion: 1989.

BELGIUM

DEN NORSKE STATS OLJESEKSKAP AS and HIMONT INC. Antwerp. 180,000 mt/y polypropylene plant. $190 MM. Tech: Himont. Feedstock: propane. Completion: 1990.

CHEMICAL BELGIUM. Meerhout. 120,000 mt/y polyethylene expansion. Feed: ethylene. $30 MM. Completion: 1990.

FINAMONT. Feluy. 30,000 mt/y polystyrene unit under construction. Eng: Tecnimont. Completion: 1989.

FINANESTE. (65% Petrofina, 35% Finnish Neste). **Antwerp.** 450,000 mt/y ethylene unit. Feed: naphtha. Contractor: MW Kellogg. Completion: 1991.

NESTE POLYPROPYLENE BV. Beringen. 120,000 mt/y polypropylene unit under construction. Himont Spheripol tech. Eng: Tecnimont. $70 MM. Completion: end 1989.

PETROCHIM. Antwerp. 20,000 mt/y synthetic rubber and thermoplastic elastomer plant expansion. $37 MM.

BRAZIL

CAPUAVA CARBONOS INDUSTRIAIS. Triunfo, RS. 27,000 mt/y carbon black unit. Feed: ethylene tar. Planned. Completion: 1991.

***CELBRAS QUIMICA E TEXTIL. Camaçari, Bahia.** 27,000 mt/y polyester unit planned. Feed: dimethyl terephthalate, ethylene glycol. Completion: early 1990.

Poços de Caldas, MG. 6,000 mt/y polyester expansion under construction. Feed: terephthalic acid, ethylene glycol. Completion: early 1990.

COPENE. Camaçari. 25,000 mt/y butene 1. Feed: raffinate 2. $15 MM.

18,000 mt/y isoprene unit under construction. Feed: pentenes. $35 MM. Completion: 1989.

13,500 mt/y octenes unit under construction. Feed: raffinate 3. $6 MM. Completion: 1990.

***COPENOR. Camaçari, Bahia.** 30,000 mt/y formaldehyde expansion. Feed: methanol. $7 MM. Completion: 1990.

COPERBO. Cabo. 40,000 mt/y styrene-butadiene rubber, polybutadiene expansion under construction. Staff crews. Completion: 1989.

***COPESUL. Triunfo.** 71,000 mt/y ethylene, 40,000 mt/y propylene, 12,000 mt/y butadi-
toluene, 9,000 mt/y xylene mix units. Feed:
ene, 55,000 mt/y benzene, 34,000 mt/y
naphtha. Completion: 1989.

***METANOR. Camaçari, Bahia.** 12,000 mt/y CO, 3,600 mt/y H_2 units under construction. Feed: syngas. Contractor: White Martins. Union Carbide tech. $15 MM. Completion: Dec. 1988.

***OXIQUÍMICA. Triunfo.** 25,000 mt/y acrylic acid, 30,000 mt/y esters planned. Feed: propylene. $55 MM. Contractor: Mitsubishi. Completion: 1991.

OXITENO. Triunfo. 25,000 mt/y acrylic acid, 30,000 mt/y acrylates. Feed: propylene. Planned. Completion: 1990.

20,000 mt/y MEK and isopropanol units planned. Feed: n-butenes. $25 MM. Contractor: Petroquisa/Oxiteno. Completion: 1989.

***PETROQUÍMICA UNIÃO. Santo André.** 440,000 mt/y ethylene, 245,000 mt/y propylene, 75,000 mt/y butadiene, 386,000 mt/y aromatics units (all total capacities) under way. Feed: naphtha. Completion: 1991.

***POLIALDEN PETROQUIMICA. Camaçari.** 100,000 mt/y polypropylene under evaluation. Feed: propylene.

***PROSINT-PRODUTOS SINTÉTICOS. Rio de Janeiro.** 118,800 mt/y methanol expansion by mid 1989, 191,600 mt/y methanol expansion by 1992. (Requesting government approval).

BULGARIA

Burgas. 150,000 mt/y ethylene plant. Lic: Kellogg. Eng: Kellogg-Kawasaki. Contractor: Neftochim. Completion: 1990.

Devnja. 150,000 mt/y vinylchloride monomer, 120,000 mt/y ethylene dichloride units in engineering stage. Contractor: TEC. Completion: 1990-91.

CANADA

ALBERTA GAS ETHYLENE. Joffre, Alberta. 680,000 mt/y ethylene, 20,000 mt/y propylene, 28,000 mt/y butadiene, 27,000 mt/y aromatics plant planned. Feed: ethane. Completion: 1992.

ALBERTA NATURAL GAS. Scotford. 2,000 t/d methanol, 11,600 b/d MTBE. Feed: natural gas, butane. Before ERCB. $600 MM.

***BFGOODRICH CANADA INC. Niagara Falls, Ont.** Polyvinyl chloride resins expansion planned. Feed: vinyl chloride. $60 MM. Completion: early 1990.

KEMTEC. Montreal, Que. 400 MM lb/y paraxylene, 150,000 t/y cumene units in engineering stage. Contractor: Partec Lavalin. Completion: 1989.

***NOVA** (with partners). **Red Deer, Alta.** Petrochemical complex planned.

***POLYSAR LTD. Corunna (Sarnia).** Ethylene expansion. $250 MM. Completion: Late 1989.

CHILE

***MINCO.** 560,000 mt/y ammonia-urea plant. $350 MM. Planned.

CHINA

***Anda.** 20,000 mt/y monomethyl-metacrylate unit under construction. Contractor: Tecnimont. Completion: 1990.

Fushun, Liaoning Province. 60,000 mt/y polypropylene unit under construction. Eng: Tecnimont. Completion: 1989.

50,000 mt/y ethylene oxide and ethylene glycol units. Royal Dutch Shell process. $53.5 MM. Contractor: Technip. Completion: 1991.

*72,000 mt/y linear alkylbenzene, 54,000 mt/y linear olefins units. UOP tech.

*120,000 mt/y ethylene unit. Lummus Crest tech.

80,000 mt/y lld polyethylene unit. Sclairtech process. Lic-eng-supply contractor: Lummus Canada.

***Erlian, Inner Mongolia.** 300,000 mt/y ammonia, 520,000 mt/y urea. Planned.

Harbin. 22,000 mt/y phthalic anhydride plant under construction. Contractor: Davy McKee. Completion: 1989.

Jinan. 75,000 mt/y purified terephthalic acid in engineering stage. Contractor: MES. Completion: 1991.

Luzhou. 150 t/d ammonia expansion under way. $10 MM. Contractor: Humphreys & Glasgow.

Panjing, Liaoning Province. 130,000 mt/y ethylene plant. Feed: ethane, propane, butane from Liao He field. Design-eng-tech: Lummus Crest. Contractors: TEC, C. Itoh, and TPL. Completion: Sept. 1991.

125,000 mt/y lld polyethylene, 40,000 mt/y polypropylene, 10,000 mt/y butene 1 units. Lic: BP on polyethylene, Mitsui PC on polyprop, IFP on butene. Contractor: Technipetrol. Completion: March 1991.

Puyang. 1,000 mt/d ammonia plant. Feed: natural gas. Contractor: Uhde. Completon: 1989.

1,760 mt/d urea unit in engineering stage. Contractor: Snamprogetti. Completion: 1989.

Shengli. 80,000 mt/y SBR unit under construction. Contractor: Mitsubishi Heavy.

Tianjin. 20,000 mt/y propylene oxide unit. Contractor: TEC. Completion: 1989.

CHINA HUNAN IMPORT CORP. Zhuzhou. 25,000 mt/y polyvinyl chloride resins in engineering stage. Contractor: MES. Completion: 1989.

CHINA NORTH INDUSTRIES CORP. Lanzhou. 44 MM lb/y toluene diisocyanate plant. Contractor: BASF AS.

DONG TING NITROGEN FERTILIZER COMPLEX. Yueyang, Hunan. 1,000 mt/d ammonia unit in engineering stage. Lic: Kellogg. Eng: Sinokellogg. Contractor: Sinopec. Completion: 1989.

JILIN CHEMICAL IND. Jilin. 9,500 mt/y polystyrene unit in engineering stage. Contractor: Toyo. Completion: 1989.

LANZHOU CHEMICAL INDUSTRY CO. Lanzhou. 60,000 mt/y lld polyethylene plant. Lic: BP. Eng: SinoKellogg. Contractor: Sinopec. Completion: 1990.

PANZHIHUA IRON AND STEEL WORKS. Dukou. 7,000 mt/y ammonia, 8,000 mt/y sulfuric acid units in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

QILU PETROCHEMICAL. Qilu, Shandong Province. 70,000 t/y polypropylene plant in engineering stage. Himont tech. $40-50 MM. Eng: Tecnimont. Completion: late 1989.

SHANGHAI PETROCHEMICAL COMPLEX. Shanghai. 120,000 mt/y ethylene glycol-ethylene oxide units under construction. Design: Scientific Design. Contractor: TEC. Completion: 1989.

70,000 mt/y polypropylene unit. Contractor: Tecnimont. Completion: 1990.

SICHUAN CHEMICAL WORKS. Sichuan. 600 mt/d ammonia-fertilizer plant. $50 MM. Contractor: MW Kellogg. Completion: late 1989.

XIANGTAN FINE CHEMICAL CO. Hunan Province. 1,500 mt/y skid-mounted ethylene amine plant. Prebuild and ship by MACC, Calgary and Fort Saskatchewan Eng. Serv., Canada. $3 MM.

CHINA, TAIWAN

CHINA AMERICAN PETROCHEMICAL CL. Lin Yuan. 250,000 mt/y terephthalic acid expansion under construction. Feed: paraxylene. Contractor: Chiyoda. Completion: June 1989.

CHINESE PETROLEUM CORP. Kaohsiung. 400,000 mt/y ethylene, 230,000 mt/y propylene, 67,500 mt/y butadiene, 239,000 mt/y aromatics units under construction. Feed: LPG, naphtha, gas oil. Contractors: Kellogg and CTCI. Completion: mid 1991.

12,000 b/d aromatics extraction unit to produce BTX. Engineering stage. Arco process. Lic-design: HRI Inc. Completion: 1990.

CHINA PETROCHEMICAL DEVELOPMENT CORP. Kaohsiung. 2,000 mt/y naphthalene unit under construction. Feed: fuel oil.

Ta-Sheh. 66,000 mt/y acrylonitrile expansion planned. Feed: propylene. 80,000 mt/y acetic acid expansion planned. Feed: carbon monoxide.

Toufen. 65,000 mt/y caprolactam expansion planned. Feed: cyclohexane.

CHIUNGLONG PETROCHEMICAL CL. Kaohsiung. 22,000 mt/y polypropylene glycol unit under construction.

FORMOSA CHEMICALS & FIBRES CORP. Suao. 200,000 mt/y ethyibenzene-styrene monomer unit. Mobil/Badger vapor phase and Fina/Badger processes. Completion: mid 1989.

FORMOSA PLASTICS CORP. Lin Yuan. 450,000 mt/y ethylene plant under construction. Feed: naphtha. Design-eng: Stone & Webster. Completion: early 1989.

HO TUNG CHEMICAL CORP. Jen-Wu, Kaohsiung. n-paraffins plant under construction. Feed: kerosine, light diesel.

NAN YA PLASTICS CORP. 250,000 mt/y phthalic anhydride unit in engineering stage. Von Heyden low energy process. Contractor: Davy McKee. Completion: 1990.

TAIWAN SM CORP. Kaohsiung. 100,000 mt/y ethylbenzene/styrene monomer unit in engineering stage. Contract: Mobil-Badger and Fina-Badger technology. Completion: 1989.

***TAIWAN SYNTHETICS. Taipei.** 15,000 mt/y maleic anhydride unit. Lic: Lummus. Completion: 1990.

USI FAR EAST CORP. Kaohsiung. 120,000 mt/y lld polyethylene unit under construction. Feed: ethylene. Contractors: CTCI and Mitsubishi HI. Completion: end 1989.

COLOMBIA

***AMONIACO DEL CARIBE. Cartagena.** 50 t/d ammonia expansion under construction. Feed: natural gas.

CARBOQUIMICA. Bogota. 20,000 mt/y plasticizers expansion. Planned. Feed: phthalic anhydride, oxcalcohols. Staff will build.

***PETROQUIMICA COLOMBIANA. Cartagena.** 20,000 mt/y polyvinyl chloride expansion under construction. $11 MM. Local contractors. Completion: March 1989. 120,000 mt/y polypropylene unit under construction. Union Carbide/Shell Unipol process. $80 MM. Eng: Fluor Daniel. Local contractors. Completion: Sept. 1989.

FINLAND

NESTE OY. Porvoo. 120,000 mt/y polypropylene unit under construction. Contractors: Tecnimont/Neste Eng. Completion: late 1988.

FRANCE

***ATOCHEM. Gonfreville.** 100,000 mt/y ethyibenzene expansion under construction. Completion: mid 1989.

100,000 mt/y styrene expansion under construction. Completion: mid 1989.

BEAULIEU. Dunkirk. 120,000 mt/y polypropylene unit in engineering stage. $80 MM. Lic. Union Carbide. Eng: John Brown. Completion: 1989.

***SOCIÉTÉ FRANÇAISE HOECHST. Lillebonne.** 120,000 mt/y polypropylene unit under construction. Himont technology. Completion: 1990.

MOBIL OIL. Notre Dame de Gravenchon. 12,000 mt/y polyalphaolefins unit under construction. Contractor: Serete. Completion: June 1989.

GERMANY (EAST)

Berlin. 350,000 mt/y ethylene expansion under construction. Contractor: Linde.

Schkopau. 25,000 mt/y hd polyethylene plant under construction. Unipol process. Feed: ethylene. Contractor: Linde AG.

GERMANY, WEST

***BASF. Ludwigshafen.** 140.000 mt/y acrylic acid expansion in engineering stage. Contractor: Lurgi.

COLUMBIAN CARBON. Hamburg. Carbon black expansion planned. Feed: oil.

***DEUTSCHE EXXON CHEMICAL. Cologne.** 20,000 mt/y polyisobutylene, 15,000 mt/y butenes expansion under construction. Feed: Raffinate 1. Completion: Jan. 1989.

DEUTSCHE TEXACO. Moers. 10,000 mt/y maleic anhydride unit conversion (C_4) in engineering stage. Design: Scientific Design. Completion: 1990.

DEUTSCHE SHELL CHEMIE. Cologne. 120,000 mt/y polypropylene plant. Unipol process. Lipp/Shac tech. Completion: 1989.

EC ERDOLCHEMIE. Cologne. 6,000 mt/y isoamylene unit. Completion: 1989-90.

***HÜLS.** 125,000 mt/y styrene unit. Lic: Monsanto/LCI. Eng: Lummus. Completion: 1990.

Gelsenkirchen-Scholven. 75,000 mt/y polypropylene plant planned. Unipol process. Completion: early 1991.

Marl. 60,000 mt/y acrylic acid, acrylic ester in engineering stage. Design: JGC-Mitsubishi PC.

***ÖMV. Burghausen.** 120,000 mt/y polypropylene unit in engineering stage. Contractor: Tecnimont. Completion: 1989.

RHEINISCHE OLEFINWERKE. Wesseling. 230,00 mt/y ethylene, propylene, C_4, C_5 units under construction. Feed: naphtha. Contractor: Linde and KTI. Completion 1989.

***RUHR OEL. Gelsenkirchen.** 70,000 mt/y cumene expansion planned. Feed: benzene, propylene. 40,000 mt/y ethylene, 25,000 mt/y propylene expansion planned. Feed: naphtna. Contractor: Linde.

UNION RHEINISCHE BRAUNKOHLEN KRAFTSTOFF. Wesseling. 267,000 mt/y propylene unit. Contractor: German Linde. Completion: late 1989.

HUNGARY

BORSODI VEGYI KOMBINÁT. Kazincbarcika. 25,000 mt/y MDI, diphenylmethane diisocyanate. Feed: aniline. Contractors: Chisso, Mitsui Toatsu. Completion: 1990.

TISZAI VEGYT KOMBINAT. Leninváros. 60,000 mt/y polypropylene unit under construction. Feed: propylene. Contractor: Tecnimont. Completion: 1989.

INDIA

***ANDHRA PETROCHEMICAL LTD. Visakhapatnam, Andhra Pradesh.** 30,000 mt/y oxy-alchohols unit in engineering stage. $100 MM. Con: Davy Powergas. Completion: 1990.

ADARSH. Udhna, Surat. 3,000 mt/y maleic anhydride unit under construction. Design: Scientific Design. Completion: 1990.

ASIAN PAINTS INDIA LTD. Bombay. 13,500 t/y phthalic anhydride plant in engineering stage. Contractor: Davy McKee AG. Completion: 1989.

ARAVALI FERTILIZERS LTD. Sawai Madhopur, Rajasthan. 1,350 mt/d ammonia plant, two 1,100 mt/d urea plants. $370 MM. Snamprogetti tech. Completion: end 1988.

ASSAM INDUSTRIAL DEVELOPMENT CORP. Maren-Lakwa. Planned facility for 7,500 t/y methanol, 12,000 t/y formaldehyde, 6,000 t/y PVC. Engineering on methanol: Humphreys & Glasgow.

CTI INVESTMENTS LTD. Manali, Madras. 4,200 t/y MEK unit in engineering stage. $15 MM. Contractor: Davy Powergas India. Completion: 1990.

DEEPAK FERTILIZERS & CHEMICALS CORP. LTD. Taloja, Maharashtra. 300 t/d methanol unit in engineering stage. $70 MM. Contractor: Davy Powergas India. Completion: 1990.

***GUJARAT NARMADA VALLEY FERTILIZER. Bharuch.** 300 t/d methanol unit under construction. $70 MM. Contractor: TEC. Completion: 1990.

40,000 mt/y acetic acid unit planned. Feed: methanol. $40 MM. Contractor: Mitsui Eng. BP.

***GUJARAT STATE FERTILIZERS CL. Fertilizernagar.** 50,000 mt/y caprolactam unit under construction. Feed: benzene. $307 MM. BASF tech. Contractor: Uhde. Completion: 1990.

1,350 mt/d ammonia expansion planned. Feed: naphtha, natural gas. $230 MM. Completion: early 1991.

10,000 mt/y melamine expansion planned. Feed: urea. $31 MM.

HALDIA PETROCHEMICALS. Calcutta. 10,000 mt/y ethylene oxide, 60,000 mt/y ethylene glycol units in engineering stage. Design: Scientific Design. Completion: 1990.

Haldia. 60,000 mt/y polypropylene unit under construction. Contractor: Tecnimont. Completion: 1989.

HERDILLIA CHEMICALS LTD. Thane. 3,500 mt/y alkyl phenols unit under way. Feed: phenol olefins. Contractor: Power Gas India.

10,000 mt/y EDPM rubber. Feed: ethylene, propylene. Planned.

PETROCHEMICALS — continued

2,000 mt/y diphenyl oxide, 1,500 mt/y isopropyl phenols, 1,000 mt/y plasticizers units. Planned. Feed: phenol, propylene, phosphorous, oxychloride.

HINDUSTAN POLYMERS. Visakhapatnam. 5,000 mt/y ABS planned. Completion: Dec. 1988.

66,000 mt/y styrene expansion planned. Feed: ethylene, benzene.

20,000 mt/y polystyrene expansion planned. Feed: styrene.

INDIAN PETROCHEMICALS CORP. LTD.

Baroda. Orthoxylene, mixed xylene, paraxylene expansion. Feed: naphtha. UOP-Mobil tech. Contractor: EIL. Completion: March 1989.

Nagothane.

NEW PROJECTS TO BE COMPLETED IN 1989:

300,000 mt/y ethylene, 30,000 mt/y propylene units, 36,000 mt/y FCC propylene recovery unit. Feed: gas. Lic: Stone & Webster. Contractor: EIL.

80,000 mt/y ld polyethylene unit. Feed: gas. Lic: CdF Chimie. Contractor: EIL.

160,000 mt/y lld polyethylene unit. BP process.Design-const: Technip, Dodsal-India. $59.2 MM.

50,000 mt/y ethylene glycol, 5,000 mt/y ethylene oxide, 3,600 mt/y diethylene glycol, 160 mt/y triethylene glycol units. Feed: gas. Lic: Union Carbide. Contractor: EIL.

60,000 mt/y polypropylene expansion under construction. Feed: gas. Lic: Tecnimont, Himont. Contractor: EIL.

1,740 mt/y acetylene black unit under finalization. Feed: gas. Contractor: EIL.

NAGARJUNA FERTILIZERS & CHEMICALS LTD. Kakinada. 1,500 mt/y urea, 900 t/d ammonia units under construction. Feed: naphtha. Contractors: Snamprogetti, PDIL. Completion: May 1991.

***NATIONAL FERTILIZER LTD. Nangal.** 31 MMcfd hydrogen PSA unit under construction. Contractor: Linde. Completion: 1989.

NATIONAL PETROCHEMICAL CORP. Koyali, Gujarat. 100,000 mt/y ethylene, 60,000 mt/y propylene, 9,000 mt/y butadiene, and 12,000 mt/y mixed butadienes.

POLYPROPYLENE INDIA LTD, Mathura District. 30,000 t/y polypropylene. Lic: Solvay tech. Completion: mid 1990. (29% Kanoria Group, 11% each Solvay, Pradeshiya Industrial Investment Corp., 49% public).

POLYCHEM LTD. Nira, Maharashtra. 2,000 mt/y methyl acetate unit. Feed: vinyl acetate monomer. Completion: early 1990.

RELIANCE INDUSTRIES LTD. Hazira. Ethylene oxide-ethylene glycol units in engineering stage. Design: Scientific Design. Completion: 1990.

RASHTRIYA ISPAT NIGAM. Visakhapatnam. 22,000 mt/y BTX, 33,000 mt/y crude benzole hydrogenation units in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

***SILICATE LTD. Uran, Maharashtra.** Ethane-propane recovery unit in engineering stage. Contractors: NKK, Davy Powergas India. $77 MM. Completion: 1989.

SYNTHETICS & CHEMICALS LTD. Bareilly. 47,000 mt/y SBR plant, 14,000 mt/y butadiene, styrene, toluene expansion planned.

Feed: benzene, ethyl alcohol, petrobutadiene.

***THIRUMALAI CHEMICALS LTD. Ranipet (Tamil Nadu).** 10,000 mt/y maleic anhydride unit planned. Feed: benzene. $12 MM. Contractor: Alusuisse Italia. Completion: mid 1990.

INDONESIA

PERTAMINA. Cilacap, Java. 270,000 mt/y paraxylene, 120,000 mt/y benzene, 11,220 mt/y aromatics, 23,000 LPG, 93,720 mt/y raffinate units. Contractor: JGC Consortium. Completion: 1990.

PERTAMINA, BRITISH PETROLEUM, CHEVRON (Gulf Corp.). Sengkang gas field, south Sulawesi. 1,500 mt/d ammonia plant. $270 MM. Planned. Completion: 1989.

***PT GEMA POLYTAMA KIMIA. Cilegon, Indonesia.** 44 MM lb/y polyols plant in engineering stage. License: Arco. Eng: Bechtel. Completion: 1989.

IRAN

NATIONAL PETROCHEM. Arak. 240,000 mt/y ethylene plant. 60,000 mt/y lld polyethylene plant. 60,000 mt/y hd polyethylene plant. $1.5 billion. Contractors: Technipetrol and KTI. Uhde on hd polyethylene. Completion: 1992.

Esfahan. 50,000 mt/y linear alkylbenzene unit. Contractor: Snamprogetti. Completion: 1989.

60,000 mt/y dimethyl terephthalate unit under constructon. Contractor: Krupp Koppers. Completion: 1989.

Shiraz. 1,200 mt/d ammonia unit under construction. Contractor: Humphreys & Glasgow.

IRAQ

Central Iraq. South of Baghdad. Complex No. 2: 450,000 mt/y ethylene unit. $2 billion. Consult: Bechtel UK.

ITALY

***DISTILLERIE ITALIANE. San Giovanni Valdarno.** 40,000 mt/y polyester, 75,000 mt/y plasticizers expansion under construction. Completion: end 1988.

***ENICHEM. Augusta.** 240 t/d kerosene feed pretreatment expansion under construction. Eng: CTIP.

MARGHERA BUTADIENE SpA. Porto Marghera. 60,000 butadiene extraction unit under construction. Contractor: Tecnimont. Completion: 1989.

JAPAN

***JAPAN SYNTHETIC RUBBER CL. Kashima.** 16,000 mt/y SB latex unit. Feed: butadiene, styrene. $43 MM. Contractor: JSR. Completion: May 1989.

***MITSUBISHI MONSANTO. Yokkaichi.** 6,000 mt/y polyvinyl butyrale. Completion: 1989.

STANDARD OIL CHEMICAL CO. with MITSUI TOATSU. Osaka. 9,000 mt/y maleic anhydride conversion. Feed: n-butane. Planned. Completion: 1989.

***UKISHIMA POLYPRO CL. Kawasaki.** 80,000 mt/y polypropylene unit planned. Feed: propylene. Lic: Mitsui. Completion: Aug. 1989.

KOREA

ARCO CHEMICAL and YUKONG LTD. Ulsan. 100,000 mt/ypropylene oxide and 225,000 mt/y styrene units in engineering stage. Contractor: Badger. Arco tech. Completion: 1990.

*270,000 mt/y ethylbenzene unit in engineering stage. Mobil-Badger Tech. Contractor: Badger. Completion: 1990.

***DAELIM INDUSTRIAL CL. Yeochon.** 250,000 mt/y ethylene, 132,000 mt/y propylene, 98,000 mt/y mixed C_4's, 66,000 mt/y aromatics (from benzene), 120,000 mt/y hd polyethylene units under construction. Feed: naphtha, gas oil. Completed: June 1989.

DAINONG PETROCHEMICAL INDUSTRY CL. Ulsan. 2,000 mt/y phthalic anhydride unit under construction. Feed: maleic anhydride. Staff crews. Completion: early 1989.

*5,000 mt/y maleic anhydride expansion under construction. Feed: benzene. Staff crews. Completion: early 1989.

DEMOCRATIC PEOPLE'S KOREAN REPUBLIC. 10,000 t/y ethylene oxide-glycol plant. $6.5 MM. Contractors: Japan Catalytic Chemical and Hitachi Shipbuilding & Engineering.

DONG BU PETROCHEMICAL. Ulsan. 15,000 mt/y polystyrene, 35,000 mt/y high impact polystyrene units under construction. Atochem process. Contractor: Technip. Completion: 1989.

HANKOOK CAPROLACTAM CORP. Ulsan. 40,000 mt/y caprolactam unit. Contractor: Daelime. Completion: Nov. 1988.

KOHAP-CHEM. CORP. Ulsan. 100,000 mt/y terephthalic acid. Lic: Tecnimont. Completion: end 1989.

***KOREA KUMHO PETROCHEMICAL CL. Yeochon.** 35,000 mt/y butadiene expansion under construction. Feed: C_4. BASF process. Completion: April 1989.

***KOREA POLYOL CL. Ulsan.** 10,000 mt/y propylene glycol expansion. Completion: Dec. 1988.

***KUMHO SHELL CHEMICAL CL. Yeochon.** 8,500 mt/y resins, 10,000 mt/y solvents, 20,000 mt/y diphenylol propane units planned. $142 MM. Completion: 1990.

***LUCKY LTD. Naju.** 14,000 mt/y butanol, 44,000 mt/y oxoalcohol expansions under construction. Completion: Dec. 1989.

Yeochun. 35,000 mt/y acrylic acid, 32,000 mt/y acrylic ester expansions planned. Completion: Jan. 1990.

30,000 mt/y polystyrene expansion under construction (total expansion 45,000 mt/y). Completion: May 1989.

***SAMKYUNG CHEMICAL CL. Ulsan.** 20,000 mt/y plasticizers under construction. Feed: acids, alcohols. Completion: Dec. 1988.

SUNKYONG FIBRES LTD. Ulsan. 247,000 mt/y CTA, 160,000 mt/y PTA, 100,000 mt/y dimethyl terephthalate units under construction. $122 MM. Contractor: Fluor Daniel. Completion: 1989.

YUKONG LTD. Ulsan. 400,000 mt/y ethylene under construction. 212,000 mt/y propylene. 73,000 mt/y butadiene. 53,000 mt/y benzene. 40,000 mt/y toluene. 47,000 mt/y xylene. Lic: MW Kellogg. Contractor: Niigata on ethylene. Completion: Aug. 1989.

200,000 mt/y paraxylene, 50,000 mt/y orthoxylene units. Feed: xylene mix. Lic: UOP, Engelhard. Completion: Jan. 1990.

120,000 mt/y polyethylene. Feed: ethylene. Sclairtech process. Design-eng: Lummus Crest. Completion: June 1989.

100,000 mt/y polypropylene unit under construction. Feed: propylene. Himont Spheripol process. Completion: June 1989.

KUWAIT

KNPC. Mina Al-Ahmadi. 1,300 MTBE unit. Planned. Completion: end 1992.

90,000 mt/y polypropylene unit planned. Completion: end 1992.

PETROCHEMICAL INDUSTRIES. Shuaiba. 100,000 mt/y polypropylene unit. Feed: propylene. Planned. Completion: 1991.

LIBYA

RAS LANUF REFINERY AND GAS PROCESSING. Ras Lanuf. 330,000 mt/y ethylene plant under construction. Manage-coordinator: Tecnimont. Competion: 1989.

MALAYSIA

***PETROCHEMICALS MALAYSIA SDN. BHD. Johore.** 9,000 mt/y polystyrene expansion in engineering stage. $3 MM. Contractor: Mitsubishi HI. Completion: March 1989.

PETRONAS. Kuantan. 300,000 mt/y MTBE. 50,000 mt/y propylene units planned. Completion: early 1990's.

MEXICO

***CELANESE MEXICANA. La Cangrejera, VC.** 60,000 mt/y vinyl acetate. Feed: ethylene, acetic acid. Completion: 1991.

100,000 mt/y butyraldehyde, 5,400 isobutyraldehyde, units. Feed propylene. Completion: 1991.

***DERIVADOS MALEICOS SA DE CV. Apizaco, Tlaxcala.** 15,000 mt/y maleic anhydride unit. Feed: benzene. Completion: end 1992.

***INDUSTRIAS DERIVADAS DEL ETILENO SA. Apizaco, Tlaxcala.** 15,000 mt/y ethanolamines unit. Feed: ethylene oxide. Completion: end 1992.

***INDUSTRIAS RESISTOL. Lecheria.** 10,000 mt/y ABS-SAN. Completion: end 1988.

PEMEX.

Camargo, Chihuahua. 445,000 mt/y ammonia unit under construction. Lic-eng: Kellogg. Completion: 1990.

Cosoleacaque, Ver. 825,000 mt/y methanol unit in engineering stage. Contractor: Uhde-IMP. Completion: Dec. 1990.

La Cangrejera. 80,000 mt/y polyethylene unit under construction. ICI tech. Completion: June 1989.

120,000 mt/y cyclohexane unit in engineering stage. Completion: 1988.

Lazaro Cardenas, Mich. 445,000 mt/y ammonia unit under construction. Lic-eng: Kellogg. Completion: 1989.

***Morelos.** 500,000 ethylene unit under construction.

100,000 ethylene oxide unit under construction.

350,000 propylene unit in engineering stage. Completion: 1990.

100,000 polypropylene unit under construction. Completion: 1989.

50,000 acrylonitrile unit under construction. Completion: 1989.

75,000 isopropyl alcohol unit in engineering stage. Completion: 1991.

100,000 mt/y hd polyethylene unit under construction. Contractor: Asahi. Completion: Dec. 1988.

100,000 mt/y butadiene unit in engineering stage. Completion: 1990.

150,000 mt/y acetaldehyde unit under construction in engineering stage. Completion: 1989.

Salamanca. 60,000 mt/y normal paraffins and 50,000 mt/y olefins units planned. Completion: Oct-Dec. 1988.

Salina Cruz, Oax. 1,500 mt/d ammonia unit.Contractor: Kellogg. Completion: Dec. 1988.

***San Martin Texmelucan, Pue.** 50,000 acrylonitrile unit under construction. Completion: 1989.

Tula. 60,000 mt/y normal paraffin and 50,000 mt/y olefin units planned. Completion: Oct-Dec. 1988.

***SINTESIS ORGANICAS SA DE CV. Apizaco, Tlaxcala.** 15,000 mt/y plastizicers unit. Feed: 2-ethyl hexanol. Completion: end 1992.

NETHERLANDS

ARCO CHEMIE. Botlek plant, Rotterdam. 370,000 mt/y MTBE unit under construction. Contractor: Fluor Daniel. Completion: 1988.

DSM. South Limburg. 20,000 mt/y (70,000 total cap.) edpm rubber expansion planned.

15,000 mt/y (65,000 total cap.) ABS expansion under study.

22,000 mt/y polyamide 46 unit. Completion: 1990.

***SHELL NEDERLAND CHEMIE. Pernis.** 40,000 mt/y ethylene expansion. Feed: gas, gas oil, LPG. Completion: 1989.

45,000 mt/y (135,000 total cap.) polypropylene expansion. Feed: propylene. Completion: early 1989.

NIGERIA

NIGERIAN NATIONAL PETROLEUM CORP. Port Harcourt, Rivers state.

Petrochemical complex comprising:

400,000 mt/y ethylene, 100,000 mt/y propylene, 270,000 mt/y polyethylene, 35,000 mt/y ethylene glycol, 70,000 mt/y polypropylene, 15,000 mt/y butene 1, 100,000 chlorine-caustic soda, 145,000 m/ty vinyl chloride monomer, 140,000 mt/y polyvinyl chloride, 30,000 mt/y plasticizers, 26,000 m/ty 2 ethylhexane, 15,000 mt/y phthalic anhydride. $2 billion. Consult-manage-supervisor: Foster Wheeler. Completion: 1990.

NORWAY

***NORSK HYDRO as. Rafnes, Bamble.** 40,000 mt/y vinyl chloride expansion planned. Feed: ethyl-chlorine. Completion: mid 1989.

***STATOIL. Bamble.** 20,000 mt/y polypropylene expansion in engineering stage. Tech: Himont. Eng: Tecnimont. Completon: June 1989.

*50,000 ld polyethylene expansion.

PAKISTAN

DAWOOD HERCULES CHEMICAL LTD. Chichoki Mallian. Urea modernization under study. Planned.

PERU

***PETROLEOS DEL PERU SA. Talara.** 2,325 mt/y carbon black expansion under construction. Feed: FCC bottoms. Completion: late 1988.

SAUDI ARABIA

YANPET. Yanbu. 110,000 mt/y ethylene glycol unit in engineering stage. Design: Scientific Design. Completion: 1989.

SPAIN

***ATOCHEM. Prat de Llobregat.** 20,000 t/y polystyrene expansion planned (75,000 mt/y total cap.).

AISCONDEL . Tarragona. 30,000 mt/y poly vinyl chloride expansion. Completion: late 1988.

***BRILEN. Barbastro.** 10,000 mt/y polyester expansion under construction. Feed: polyethylene terephthalate. Contractor: Inventa. Completion: Nov. 1988.

CEPSA. Algeciras. 45,000 mt/y MTBE unit. Lic: UOP.

ENFERSA. Cartagena, Murcia. 30,000 mt/y urea (and ammonia) revamp. Contractor: Uhde. 1989.

Puertollano. 35,000 mt/y urea (and ammonia) revamp. Contractor: Uhde. 1989.

HIMONT (Hercules Inc. and Montedison SpA). 25,000 mt/y polypropylene plant. Planned.

REPSOL PETROLEO. La Coruña. 30,000 mt/y MTBE unit. Feed: C_4 FCC, coker. Process: UOP Hüls. Completion: end 1988.

Puertollano. 53,000 mt/y MTBE unit. Feed: raffinate 1, C_4 FCC. Completion: Spring 1989.

REPSOL QUIMICA. Puertollano. 40,000 mt/y lld polyethylene unit. 20,000 mt/y polypropylene expansion. Planned.

Tarragona. 100,000 mt/y polypropylene plant. Himont Spheripol process. $40 MM. Eng: Tecnimont. Completion: Spring 1989. *35,000 mt/y ethylene expansion. $4 MM.

***UNION EXPLOSIVOS RIO TINTO SA. Ertisa, Huelva.** 33,000 mt/y phenol-acetone expansion under way. Feed: benzene, propylene. Lic: UOP. Completion: 1989.

SWEDEN

NOBEL CHEMATUR. Stenungsund. 40,000 mt/y ethylene unit (from ethanol) in engineering stage. Design: Scientific Design.

TANZANIA

KILWA AMMONIA CO. Kilwa Masoko. $400 MM ammonia plant. Feed: natural gas (from Songo Songo Island field).

THAILAND

ETERNAL PETROCHEMICAL CL. Bangkok. 45,000 mt/y phthalic anhydride unit in engineering stage. Von Heyden low energy process. Contractor: Davy McKee. Completion: 1989.

***ICI plc. Rayong province.** 205,000 b/d purified terephthalic acid plant. Planned. Completion: 1992.

HMC POLYMERS CL. (Metro CL-Bangkok and Himont Inc.). **Mab Ta Pud, (Rayong province).** 100,000 mt/y polypropylene under construction. $30 MM. Eng: Tecnimont-Italy, Kobe-Japan. Completion: 1989.

NATIONAL FERTILIZER CORP. Rayong. 900 t/d ammonia, 1,000 t/d urea. Eng-consult: Foster Wheeler Int'l. Chiyoda. Completion: 1988.

NATIONAL PETROCHEMICAL CORP. Mab Ta Pud. 315,000 mt/y ethylene, 105,000 mt/y propylene units. Eng: Lummus Crest. Contractor: Toyo EC. Completion: Aug. 1989.

PETROCHEMICALS — continued

***PETROLEUM AUTHORITY OF THAILAND. Rayong.** Petrochemical complex 2: 500 MM lb/y aromatics and olefins. Eng. study: Contractors: Bechtel and Chem Systems. $1,000 MM. Completion: 1992.

THAI PETROCHEMICAL INDUSTRY CORP. Rayong. 1,750 t/d urea and 1,000 t/d ammonia units. $180 MM. Turnkey: Chiyoda. Completion: 1988.

THAI PLASTIC AND CHEMICAL CL. Rayong. 140,000 mt/y vinylchloride monomer, 26,000 mt/y caustic soda, 60,000 mt/y polyvinylchloride in engineering stage.Contractor: TEC. Completion: late 1990.

THAI POLYETHYLENE CL. Rayong Province. 60,000 mt/y lld polyethylene plant under construction. BP gas phase process. Contractor: MES. Completion: late 1989.

60,000 mt/y hd polyethylene unit in engineering stage. Contractor: MES. Completion: 1989.

TRINIDAD

GOVERNMENT OF TRINIDAD-TOBAGO (51%), **MW KELLOGG** (24.5%), **NORSK HYDRO** (24.5%). **Point Lisas.** 1,500 mt/d ammonia plant. Contractor: Kellogg.

FERTILIZERS OF T&T LTD. Point Lisas. 360 st/d ammonia expansion planned. $14 MM. Completion: 1989.

UNITED KINGDOM

***BITMAC. Southampton.** 2,000 mt/y phthalic anhydride expansion in engineering stage. Contractor: Lurgi.

BP CHEMICALS LTD. Hull. 200,000 mt/y mixed acetyls, acetic acid-acetic anhydride under construction. $140 MM. Manage: Davy McKee. Completion: 1989.

***Grangemouth.** 125,000 mt/y lld polyethylene unit. Contractor: Foster Wheeler Energy. Completion: late 1989.

***HUNTSMEN CHEMICAL. Carrington.** 50,000 mt/y polystyrene unit. Lic: Huntsman. Contractor: Lummus Crest BV. Completion: 1990.

***ICI.** (Chemicals, Polymers Group). **Wilton.** 60,000 mt/y terephthalic acid expansion under construction. Feed: paraxylene. Completion: 1990.

L&K FERTILIZERS LTD. (subsidiary of Kemira Oy). **Hull.** 250,000 mt/y ammonia plant under construction. Feed: acetic acid hydrogen-nitrogen byproducts (from BP plant). Contractor: Kellogg. Completion: end 1988.

SHELL CHEMICALS UK. Carrington. 130,000 mt/y polypropylene expansion under construction. Lippshac process. £48 MM. Contractor: MW Kellogg Ltd. Completion: early 1991.

U.S.S.R.

Blagoveshchensk. 230,000 mt/y pure terephthalic acid in engineering stage. Contractor: MES. Completion: 1992.

Budyennovsk. 100 mt/y polypropylene in engineering stage. $146 MM. Contractor: John Brown. Completion: 1990.

Dzerzhinsk. 25,000 mt/y acrylic acid, 40,000 mt/y acrylic esters, 40,000 mt/y acrylic emulsions in engineering stage. Processes: Nippon Shokubai KK, Dainippon Ink. Consortium coordinator: Nissho Iwai. Contractor: Mitsubishi HI. Completion: March 1991.

Mogilev. 25,000 mt/y dimethyl terephthalate expansion in engineering stage. Contractor: Krupp Koppers. Completion: 1990.

Nevinnonysk. 150,000 mt/y acetic acid in engineering stage. Contractor: MES. Completion: 1990.

Nishnekamsk. 200,000 mt/y linear alpha-olefins unit under construction. Contractor: Davy McKee. Completion: 1989.

Polotsk. 60,000 t/y ethylene-propylene and 55,000 t/y acrylonitrile.

Sumgait (Baku). 75,000 mt/y linear alkyl benzene unit under construction. Contractor: Snamprogetti. Completion: 1989.

VENEZUELA

CORPOVEN. Puerto Cabello. 2,500 b/d BTX unit. Eng-lic: UOP. $100 MM. Completion: 1990.

***ESTIZULIA. Zulia.** 20,000 mt/y polystyrene revamp. Lic: Mobil. $13 MM. Completion: 1989.

***NEGROVEN. Valencia.** 20,000 mt/y carbon black expansion under way. Feed: aromatic oil. Cabot tech. Completion: mid 1989.

***NITRORIENTE. Anzoátegui.** 495 mt/y ammonia unit. Lic-eng: Santa Fe Braun. $250 MM. Completion: 1991.

***PEQUIVEN. Carabobo.** 363 mt/y urea unit. Lic-eng: Snamprogetti. $72 MM. Completion: 1991.

El Tablazo, Zulia. 350,000 mt/y ethylene unit planned. Feed: ethane. Completion: 1991.

130,000 mt/y propylene unit. Completion: 1991.

60,000 mt/y polyvinyl chloride unit planned. Feed: vinyl chloride. Completion: 1992.

60,000 mt/y ethylene dichloride and vinyl chloride units planned. Feed: ethylene, chloride. Completion: 1992.

Jose, Anzoategui. 500,000 mt/y MTBE unit in engineering stage. Feed: Butanes, methanol. Catofin process. Contractor: Snamprogetti. Completion: 1990.

495,000 mt/y ammonia unit. Feed: natural gas. Eng: Santa Fe Braun. Completion: 1990.

Morón, Carabobo. 495,000 mt/y ammonia unit planned. Feed: natural gas. Completion: 1991.

247,500 mt/y urea unit planned. Feed: ammonia. Completion 1991.

308,000 mt/y solution urea. Feed: ammonia. Planned. Completion: 1991.

700,000 mt/y fertilizer plant. Contractor: Davy McKee. Completion: 1989.

***PLASTILAGO. Zulia.** 30,000 mt/y hd polyethylene revamp. Lic: Mitsui. $12 MM. Completion: 1990.

***PRALCA. Zulia.** 30,000 mt/y ethylene oxide-ethylene glycol units. Lic. Olin. Eng: Pequiven-Corimon. $41 MM. Completion: 1990.

PROPILVEN SA. El Tablazo, Zulia. (Pequiven, Grupo Zuliano, Mitsui Petchem., Promotora Venoco). 70,000 mt/y polypropylene unit. Feed: propylene. $85 MM. Eng: Technipetrol-Inelectra. Completion: 1990.

YUGOSLAVIA

***PROGRES PRIZREN. Prizren.** 7,000 mt/y polyamide 6 polymerization unit in engineering stage. Contractor: Zimmer AG.

Sulfur—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

***AMOCO PRODUCTION. Hale County, Tex.** 5 mt/d 3-bed Claus unit (from natural gas). Completion: June 1990.

Natrona County, Wyo. 2 mt/d Locat unit (from natural gas) under construction. Contractor: Fish. Completion: May 1989.

***CITGO PETROLEUM. Lake Charles, La.** 400 lt/d sulften SRU TG treater. Contractor: Jacobs Eng. Completion: Fall 1988.

MARATHON PETROLEUM. Garyville, La. 2 Claus SRU, 1 BSR/MDEA expansion. Contractor: Parsons. Completion: early 1989.

SHELL OIL. Anacortes, Wash. 17 mt/d design (from refinery).

Denver City, Tex. 5 mt/d design (from natural gas).

TENNECO. Chalmette, La. 70 lt/d Claus SRU expansion (250 lt/d total cap) in engineering stage. Design: Parsons. Eng: Bechtel. Completion: 1989.

BRAZIL

PETROBRÁS. Paulinia. 64 mt/d unit (from fuel gas and LPG desulf). Eng: Promon. Lic: Kellogg. Con: Staff. Completion: 1989.

São Mateus do Sul, PR. 50 mt/d unit (from retorted shale gas). Staff. Completion: 1990.

CANADA

PETRO-CANADA INC. Brazeau, Alberta. 350 mt/d sub dew point unit (from natural gas).

SHELL CANADA LTD. and MOBIL OIL CANADA LTD. Bearberry Field, (nw of Sundre), Alberta. 200 mt/d unit. (Ultra-sour demonstration pilot plant). $55 MM-Can. Completion: late 1989.

CZECHOSLOVAKIA

PKAZ. 34 MMcfd unit under construction. Sulfint process. Contractor: Integral.

CHINA

SHIJIAZHUANG COKING PLANT. Shijiazhuang. 3,000 mt/y Claus unit in engineering stage. Contractor: Krupp-Koppers. Completion: 1990.

CHINA, TAIWAN

CHINESE PETROLEUM CORP. Kaohsiung. 250 mt/d design (from refinery gas). Eng-design: CTCI. Contractor: JGC. Completion: mid 1990.

SULFUR — continued

***Kaohsiung-Linyuan.** 2.5 mt/d tail gas Scot unit under construction. Completion: mid 1989.

Tao Yuan. 100 mt/d design (from refinery gas). Amoco process. Contractor: Chiyoda. Completion: mid 1990.

GERMANY, EAST

HKW Rummelsburg, East Berlin. Flue gas desulfurization unit in engineering stage. Wellman Lord Process. £42 MM. Contractor: Davy McKee. Completion: 1990.

GERMANY, WEST

MOBIL OIL AG. Woerth. Two-stage Claus sulfreen unit. Contractor: Lurgi.

GREECE

PETROLA HELLAS. Elefsis. 26 mt/d Claus SRU. Contractor: Parsons. $2.95 MM. Skid-mounted unit to be shipped Jan. 1989. Startup: July 1989.

ITALY

***AGIP. Sannazzaro.** 100 mt/d Claus unit (from refinery gas) under construction. Contractor: Siry Chamon. Completion: 1989.

ISAB. Priolo Gargallo, Sicily. 5,200 mt/y Maxisulf unit in engineering stage. Contractor: Davy Process. Completion: 1989.

SARAS. Sarroch. 150 mt/d Claus unit (from refinery gas). SNEA process. Contractor: Techint. Completion: 1989.

KOREA

KUKDONG OIL CL. Daesan. 180 t/d sulfur recovery and tail gas treating unit under construction. Contractors: JGC, Badger, Hyundai. Completion: late 1988.

KUWAIT

***KUWAIT NATIONAL PETROLEUM. Mina Al-Ahmadi.** 100 t/d sulfuric acid regen. unit planned. Completion: end 1992.

MEXICO

PEMEX. Ciudad Pemex, Tab. 323.3 mt/d (from natural gas). Planning.

Matapionche, Ver. 27.1 mt/d (from natural gas) under construction.

Salina Cruz, Oax. 32.9 mt/d (from refinery-gas). Engineering stage. Completion: 1991.

***Tula, Hgo.** 32.9 mt/d (from refinery gas.) Under construction. Completion: 1991.

SPAIN

***REPSOL PETROLEO. Puertollano.** 64 mt/d Claus unit (from refinery) under construction. Contractor: Comprimo. Completion: Dec. 1989.

THAILAND

THAI OIL REFINERY. Sriracha. Two 57.5 units under construction. Lic: Comprimo. Eng-con: Chiyoda. Completion: 1989.

TURKEY

***TÜPRAS. Kirikkale.** 50.0 mt/d Claus unit (from refinery gas). Completion: 1992.

VENEZUELA

***CORPOVEN. Puerto La Cruz, Anzoategui.** 18 mt/d Claus unit (from refinery) under construction. Contractor: Vepica. Completion: 1988.

YUGOSLAVIA

RAFINERIJA NAFTE. Pancevo. 530 mt/d sulfolane unit. Lic: UOP. Eng-contractor: Foster Wheeler. Completion: 1989.

Gas Processing—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

***AMOCO PRODUCTION. Anton Irish CO_2 Removal, Hale County, Tex. 14 D-T HE&WT RR.** 35 MMcfd expansion. 57,000 g/d natural gas liquids. Engineering stage. Ryan Holmes-Claus 3-bed method. Completion: June 1990.

Bairoil-Wertz, Sweetwater County, Wyo. 7-26N-90W. 85 MMscfd (150,000 MMscfd total capacity) and CO_2 removal expansion under construction. 100,000 g/d natural gas liquids. Refrigeration method. Contractor: Belmont. Completion: April 1989.

***Slaughter plant, Hockley County, Tex.** 5 MMscfd expansion. Amine system. Contractor: Ref-Chem. Completion: April 1989.

***ARCO ALASKA INC. Anchorage.** Prudhoe Bay expansion. Design: RM Parsons. Completion: 1990.

Crane, Texas. 20 MMscfd cryogenic plant. $5 MM. Eng: Pan West. Construction out for bids. Completion: Dec. 1988.

***CHEVRON U.S.A. INC. E. Painter Field, Uinta County, Evanston, Wyo. 6-15N-119W.** 105 MMcfd compressor station under construction (replaces leased compression). Completion: Spring 1989.

Rangely, Rio Blanco County, Colo. 32-2N-102W. 60 MMcfd expansion-Train 2 under construction. NGL recovery. Compression only. Completion: Spring 1989.

60 MMcfd expansion-Train 3. Design stage. Compression only. Completion: 1990.

***CONOCO INC. Dragon Trail Plant, Colo.** 20 MMcfd expansion. C_3, C_4-C_5 products. Cryogenic—Joule-Thomson method. Begin construction: early 1989. Completion: Sept. 1989.

***SUN OIL. Eastland County, Tex.** 22 MMscfd cryogenic expander plant. Lic: Elcor-Ortloff. Contractor: Pro-Quip.

***TEMCO LIQUIDS CO. Bayou Black, La.** 500 b/d condensate fractionation unit in engineering stage. Eng: Frantz. Completion: 1989.

ABU DHABI

***ABU DHABI NATIONAL OIL. Thammama C, Habshan.** 540 MMscfd (total capacity) expansion in engineering stage. Process method: packed absorber (from present trayed absorber). Contractor: Fluor Daniel GB. Completion: March 1989.

ARGENTINA

***YPF. Campo Duran.** 565 MMscfd expansion in engineering stage. Product: LPG. Eng-design: Fish. Completion: 1990.

AUSTRALIA

WESFARMERS LPG PL. Kwinana. 282.5 MMcfd plant. 190,000 mt/y LPG. Contractors: Randall Corp., Clough Eng., T. O'Connor & Sons PL-Adelaide.

WOODSIDE OFFSHORE PETROLEUM PtL. Withnell Bay, Burrup Peninsula (near Karratha). 6 MM mt/y gas liquefaction plant, 2 MM mt/y LNG trains under construction. Air cooled, GT driven-MCR cycle. $3 billion. Contractors: Kellogg-JGC-Raymond. Completion: 1989-1993.

BAHRAIN

BAHRAIN NATIONAL GAS CO. Jebel Al Dukhan. 110 MMcfd plant. 111,888 g/d propane, 70,518 g/d butane, 154,434 g/d naphtha. Refrig-absorp (lean oil) method. Consult: Lummus Crest BV. Completion: Aug. 1990.

BRAZIL

***PETROBRÁS. Carmópolis, Sergipe.** 12,200 MMcfd plant. 16,600 g/d NGL mix. Joule-Thomson method. Under construction. Completion: Dec. 1988.

Lagoa Parda 2, Espirito Santo. 17,400 MMcfd plant. 37,800 g/d LPG, 12,100 g/d pentanes plus. Refrigeration-absorption method. Completion: Feb. 1990.

CANADA

***CHIEFTAIN DEVELOPMENT CL. Kikino. 10-36-62-16 W4M.** 25 MMcfd plant. Compression-TEG method. Design stage. Completion: end 1988.

***CHEVRON CANADA RESOURCES LTD. Acheson, Alta.** 18 MMcfd turbo expander plant in engineering stage. $8.4 MM Canadian. Consultant: Propak. Completion: Spring 1989.

GULF CANADA. Strachan, Alberta. Plant expansion (deep cut unit) in engineering stage. Design: Partec Lavalin. Completion: Dec. 1988.

***MID-WEST GAS TRANSMISSION CL (Norcen Energy). Carbondale. SW1-55-25 W4M.** 55 MMcfd plant. Compression-diethanolamine and Locat. Planned. $6.5 MM-Can. Completion: Dec. 1988.

***PLACER CEGO PETROLEUM. Medicine Lodge, Alberta.** 14.5 MMcfd gas treatment plant.

CHINA

Karamay Oil Field. 600,000 MMcfd LPG extraction unit. Turboexpander method. $4 MM. Contractor: Mitsubishi HI. Completion: 1989.

Zhongyuan field. 45 MMscfd turboexpander associated gas plant. 50,000 mt/y ethane,

GAS PROCESSING — continued

48,000 mt/y propane, 42,000 mt/y gasoline, 30 MMscfd dry gas. Lump sum contract: Linde.

COLOMBIA

ECOPETROL. Apiay. 18 MMscfd plant. 30,900 g/d LPG mix, 9,500 g/d debutanized natural gas. Absorption method. Engineering stage. Contractor: Technipetrol. Completion: June 1989.

***Neiva, Huila.** 10 MMcfd plant. 14,200 g/d propane, 4,700 g/d butane, 6,300 g/d debutanized natural gas. Turboexpander method. Completion: Dec. 1989.

ECUADOR

***CEPE. Libertador field, Napo.** 15 MMcfd plant. 83,200 g/d LPG, 29,000 g/d natural gasoline. Refrigeration only. Completion: July 1989.

INDIA

***OIL & NATURAL GAS COMMISSION. Gandhar and Mehsana, Gujarat; Lakwa, Assam; offshore Krishna-Godavari basin; Agartala basin, Tripura.** Five gas processing plants. 500,00 mt/y LPG.

INDONESIA

PERTAMINA. Bontang, East Kalimantan. Badak III. 1.5 MMt/y LNG train. Completion: 1990.

***TOTAL INDONESIE. Tambora-Tunu fields, East Kalimantan.** 250 MMcfd plant. 400,000 g/d raw NGL mix. Absorption-glycol method. Tenders out. Completion: 1990.

LIBYA

MOBIL OIL. 15,000 b/sd oil separation plant in engineering stage. Contractor: FW Italiana.

OCCIDENTAL. Hakim. 24,000 b/sd oil separation plant in engineering stage. Contractor: FW Italiana.

SIRTE OIL. 40,000 b/sd oil, 155 MMcfd gas separation-treating plant in engineering stage. Contractor: FW Italiana.

MALAYSIA

PETRONAS. Kerteh, Terengganu. 250 MMcfd expansion. 35 MMscfd ethane, 500,000 propane, 290,000 butane, 280,000 pentanes plus. Eng: TEC. Cryogenic expander method. Completion: 1990's.

MEXICO

PETROLEOS MEXICANOS. Cadereyta, NL. 4,000 b/d NGL fractionation unit under construction.

***Matapionche, Ver.** 150 MMcfd unit in engineering stage. Process method: Cryogenic. Completion: 1989.

***Morelos, Ver.** 11,806 b/d NGL fractionation unit under construction.

Nuevo Pemex, Tab. 500 MMcfd plant under construction. Process method: cryogenic.

24,000 b/d LPG sweetener under construction.

24,000 b/d LPG sweetener.

PAKISTAN

***BAKHRABAD GAS SYSTEMS LTD. Muradnagar Upazilla.** 60 MMscfd plant. Gas and condensate products. 3-tower closed-cycle adsorption system. $2.5 MM. Completion: end 1989.

Feni field. 40 MMscfd plant. $2 MM. Completion: end 1989.

***OIL & GAS DEVELOPMENT CORP. Pirkoh field.** 100 MMscfd plant under construction. Absorption-triethylene glycol method. Contractor: Alco-Canada. Completion: Dec. 1988.

Loti field. 20 MMscfd and 50 MMscfd plants. Absorption-triethylene glycol method. Contractor: CE Natco-Singapore. Completion: Dec. 1988.

***PPL.** 25 MMscfd gas separation plant in engineering stage. Product: LPG. Contractor: NKK. Completion: July 1989.

PERU

***PETROLEOS DEL PERU. Aguaytia-Ucayali.** 30 MMcfd plant. 29,400 g/d LPG, 25,200 g/d gasoline, 33,600 g/d kerosine-diesel. Refrigeration only. $40 MM. Completion: 1990.

Camisea-Cuzco. 1,000 MMcfd plant. 600,000 g/d LPG, 400,000 g/d gasoline, 700,000 g/d naphtha. $1,300. MM. Completion: 1992.

QATAR

QATAR GENERAL. Arabian Gulf. 10 billion cfd plant in engineering stage. Phase I. Contractor: Bechtel. Completion: 1991.

SAUDI ARABIA

ARABIAN AMERICAN OIL. Safaniya. GOSP-4 complex: 100 Mscfd, 250,000 b/d in preliminary design. Lummus Crest.

SYRIA

AL-FURAT PETROLEUM CO. Tayyim field, ne Syria. (Syrian Petrolum 50%). 30 MMcfd associated gas treatment plant. $30 MM. Contractor: Propak Systems-Canada.

SWEDEN

SHELL RAFF. AB. Gothenburg. 170 t/d LPG, 70 t/d pentanes+. Contractor: Linde.

THAILAND

PETROLEUM AUTHORITY OF THAILAND. (25% PTT, 75% Thai Shell Exploration-Production). **Sirikit field, Kamphaeng Phet.** 25 MMcfd plant. 35,000 t/y LPG.

Rayong Province. 200 MMcfd (gas from Unocal Thailand fields). 234,900 mt/y LPG, 47,000 mt/y natural gasoline under construction. $78 MM. Consult: Linde AG. Contractors: Toyo Menka, Fish-U.S. NKK on ethane, propane, butane units. Completion: April 1990.

Related Fuels—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

UNITED STATES

AMCOAL (MW Kellogg and Bechtel Development). Quemahoning Indus. Park, Johnstown, Somerset County, Pa. Coal gasification plant processing 485 t/d high sulfur coal. When completed the plant will generate 60 mg electricity. Completion: 1991.

***OHIO ONTARIO CLEAN FUELS INC. Warren, Ohio.** 12,280 b/d coal to liquid fuel (using catalytic process to liquefy crushed and ground coal). Design: HRI. Eng: Stone & Webster. $225 MM. Completion: 1995.

BRAZIL

PETROBRÁS. SÃO MATEUS DO SUL, PR. 2,500 b/cd shale oil extraction. Petrosix process. Staff. Completion: 1990.

CANADA

DOME PETROLEUM LTD. Lindbergh, Alta. (40 mi nw of LLoydminster). 15,000 b/d from oil sands. $300 MM. Planned.

Bonnyville, ne of Edmonton, Alta. 25,000 b/d heavy oil. Proposed.

HUSKY OIL OPERATIONS LTD. Lloydminster, Sask. 54,000 b/d heavy oil upgrader in engineering stage. $1.2 billion. Hydrocracker (HRI) and delayed coker (FW). Completion: 1992.

PETROCANADA. Fort McMurray. 70,000 b/d from oil sands. $4 billion. Planned.

***SUNCOR. Fort McMurray.** 18,000 b/d crude expansion from oil sands (71,000 b/d total capacity). $50 MM. Completion: 1991.

CHINA

***SHOUGANG . Beijing.** 1000 t/d coal gasification plant in engineering stage. Con: CTIP. Completion: 1991.

FINLAND

KEMIRA OY. Oulu. 250 t/d ammonia from 650 t/d peat. Contractor: Uhde. Completion: 1989.

ITALY

ENICHEM/ANIC. Porto Torres. 500,000 t/y HCCS Reocarb (high concentration coal slurry) unit under construction. Contractor: Snamprogetti. Completion: 1989.

SWEDEN

NYNÄS ENERGY CHEMICALS COMPLEX AB. (A. Johnson & Co., Sveriges Investeringsbank AB, AGA AB, Superfos a/s). **Nynashamn.** 750,000 t/y coal gasification to 450,000 t/y ammonia. Completion: 1988-89.

UNITED KINGDOM

***BRITISH COAL. Point of Ayr, North Wales.** 2.5 t/d coal liquefaction pilot plant under construction. £10 MM. Contractor: Simon-Carves. Completion: 1989.

Pipelining—WORLDWIDE CONSTRUCTION

*Designates projects listed for the first time in the Journal.

U.S. CRUDE LINES

ALL AMERICAN PIPELINE. 525 miles, 30-in. from McCamey to Webster, Tex. Contractor: RB Potashnick (301 miles). Completion: 1990.

CELERON PIPELINE. 10 miles, 24-in. from Las Flores Canyon, Calif. to Gaviota, Calif. under construction. Completion: 1989.

PACIFIC TEXAS PIPELINE. 1,030 miles, 42-in. from Port of Los Angeles, Calif. to Midland, Tex. Contractors: Stearns-Rogers, Potashnick, Morrison-Knudsen, ARB, Southeast Pipeline. Completion: early 1989.

SOUTHERN CALIFORNIA PIPELINE SYSTEM. (Chevron Pipeline (project manager), Four Corners Pipeline, Shell, Texaco).

Los Padres Pipeline: 124 miles, 30-in. from Gaviota, Santa Barbara County, Calif. to Emidio, Kern County, Calif. $350 MM. Proposed.

Angeles Pipeline: 130 miles, 30-in. from Emidio, Kern County, Calif. to Los Angeles Basin refineries. $250 MM. Planned. Completion: mid 1992.

***TEXACO PIPELINE INC.** 1.5 miles, 6-in. in San Juan Co., Utah planned. Completion: early 1989.

U.S. PRODUCT LINES

***CHEVRON PIPELINE.** 52 miles, 12-in.; 123 miles, 10-in.; 20 miles, 8-in. from Sour Lake, Tex., to Ft. Worth, Tex. on Mesquite Products line under construction. Contractors: Sunland, H&K, Driver. Completion: early 1989.

***COLONIAL PIPELINE.** 20 miles, 16-in. 10 miles sw to 10 miles ne of Sweetwater, Tenn. on lateral system from Chattanooga to Knoxville, Tenn. ROW. Completion: late 1988.

***EXPLORER PIPELINE.** 28-in. mainline expansion from Gulf Coast to Dallas-Fort Worth area under study.

KOCH INDUSTRIES INC. 310 miles, 10-12-in. from Rosemount, Minn. to Milwaukee, Wis. Completion: late 1988.

MESQUITE PRODUCTS PIPELINE. (Chevron Pipeline). 18 miles, 14-in; 150 miles, 12-in; 83 miles, 8-in. from Sour Lake, Tex. to Fort Worth, Tex. upgrading planned. $65 MM. Completion: late 1988.

PHILLIPS PIPELINE. 40 miles, 12-in. ethylene line from Alvin, Tex. to Pasadena, Tex. Completion: March 1989.

U.S. GAS LINES

***ALGONQUIN GAS TRANMISSION.** 8 miles, 12-in. and 0.4 of 10-in. loop from Medway, Mass. to Hopkinton, Mass. Completion: Nov. 1988.

ANR PIPELINE. 379 miles, 30-in. from Defiance, Ohio to Leidy, Penn. (Erie line). Before Ferc.

***ARCO ALASKA INC.** 13 miles, 60-in. loop of existing lines for Prudhoe Bay field. Design: CF Braun. Completion: 1989.

CANADIAN GATEWAY PIPELINE SYSTEM. (Consolidated Natural Gas Co. and Texas Eastern Transmission Corp.). 142 miles, 30-36-in. from Marilla, NY to New York City area. Before Ferc. Completion: Nov. 1988.

***CMS ENERGY CORP.** (Consumers Power). 25.7 miles, 26-in. from Mount Pleasant, Mich. to MCV plant, Midland, Mich. Engineering-design stage. Completion: Sept. 1989.

2.3 miles, 10-in. from Midland City Gate, Steward Road, Mich. to MCV plant, Midland, Mich. Engineering-design stage. Completion: June 1989.

1.3 miles, 8-in. loop on existing 6-in. line to MCV plant, Midland, Mich. Engineering-design stage. Completion: June 1989.

***COLORADO INTERSTATE GAS.** 11 miles, 2-6-in. in Colo., Kans., Okla., Texas, Utah, Wyo. Contractor: Flint Eng. Completion: Dec. 1988.

22.6 miles, 20-in. Opal pipeline, in Sweetwater County, Wyo. Completion: Nov. 1988.

COLUMBIA GAS TRANSMISSION CORP. 74 miles, 4-20-in. in Pennsylvania, Maryland, Kentucky, West VA, Ohio. Before Ferc.

50 miles, 3-16-in. in New Jersey, West VA, Ohio.

CONSOLIDATED NATURAL GAS. 6.7 miles, 24.2 miles, 6 miles, 6.5 miles, various in.; and 25.9 miles, 4-6-in., in Westmoreland and Allegheny Counties under construction. PNG crews. Completion: Dec. 1988.

*33.5 miles, 24-in. from Therm City Station to Biddlecum Road in Oswego County, N.Y. Planned.

*25 miles, 30-in. from Coxcomb Gate assembly to Stull Gate Assembly, Butler and Allegheny Counties, Pa. Planned.

*27 miles, 24-in. from Leesburg, Va., to the border of Prince William and Fauquier Counties, Va.

COLUMBIA GULF TRANSMISSION. 4 miles, 20-in. loop in South Pecan Lake. Completion: Nov. 1988.

EL PASO NATURAL GAS. 14.8 miles, 30-in. loop lines in Arizona. Before Ferc.

***EMPIRE STATE PIPELINE.** (Coastal Corp., Houston, and Union Enterprises Ltd., Toronto). 155 miles, from Niagara Falls to Syracuse to connect with Union Gas Ltd.'s Canadian system. $82.5 MM.

ENRON CORP. 50 miles, 30-in. from Bayou La Batre, Ala. to Mobile, Ala. Pending Ferc approval. Completion: Jan. 1989.

191.2 miles, 4-20-in. from Louisiana to South Florida. Pending Ferc.

30 miles, 24-in. north of Janesville, Wisc. to sw corner of Waukesha County. Pending Wisconsin PUC.

Phase II: 80 miles, 3[illegible]; 40 miles, 24-in; 28 miles, 20-in; [illegible] miles, 4-16-in. expansions from Baldwin County, Ala. to Broward County, Fla. Before Ferc. Completion: 1988.

INDIANA OHIO PIPELINE. 110 miles, 20-in. from Grant County, Ind. to Warren County, Ohio. Before Ferc. Completion: 1989.

***JUBILEE PIPELINE.** (Enron Corp. and others) 81.6 miles, Mobile Bay off Alabama, before Ferc. Completion: Jan. 1990.

KERN RIVER GAS TRANSMISSION. (Williams Cos. and Tenneco). 762 miles, 36-in. from Kemmerer, Wyo. to Bakersfield, Calif. Proposed. $800 MM.

***MEXUS INTERSTATE PIPELINE INC.** (Intercon Gas Inc.) 1,625 miles along the U.S.-Mexico border from Reynosa, Tamaulipas, to Tijuana, Baja Calif. 30 miles, 30-in. laterals to U.S. border.

340 miles, 30-in. to Pecos, Webb, and Hildalgo Counties, Tex. $303 MM. Completion: early 1990s.

MICHIGAN CONSOLIDATED GAS. 25.2 miles, 10¾-in. and 6.8 miles, 6⅝-in. mainline extension from Forest township, Cheboygan County to Pulawski township, Presque Isle County, Mich.

MOJAVE PIPELINE. (Enron Corp. and El Paso Natural Gas). 383 miles, from San Ardo, Calif. to Needles station near Topock, Ariz. (Lateral to Kern County, Calif.). $250 MM. Proposed.

***MORAINE PIPELINE** (MidCon Corp.). 17.8 miles, 20-in. from Lake County, Ill., to Kenosha County, Wis. $6.5 MM. Completion: Nov. 1988.

***NATURAL GAS PIPELINE CO. OF AMERICA.** 97 miles, 30-in. from southern Oklahoma to NGPL Amarillo, Tex. extension. Before Ferc.

94 miles, 30-in. northeast Texas connecting East Texas to Gulf coast main line. Before Ferc. Total cost: $108 MM.

NORTHERN BORDER PIPELINE. 396 miles, 36-in. mainline extension from Ventura, Iowa, to Chrisman, Ill. Before Ferc. $374 MM.

SEAGULL ENERGY CORP. 42 miles, 24-in. from Oyster Lake Station to Old Ocean, Tex. Pending.

***SOUTH GEORGIA NATURAL GAS.** 90 miles, 12-in. from Ellaville, Fla., to Jacksonville, Fla. $20 MM. Completion: Fall 1989.

SOUTHERN NATURAL GAS. 50 miles, 20-in. Logansport loop, Bienville, La. to Perryville, Miss. under construction. Contractor: WHC Inc. Completion: Dec. 1988.

***SOUTHWEST GAS CORP.** 16 miles, 16-in. from Wadsworth valve to Silver Springs, Nev. Completion: Fall 1988.

SUNSHINE NATURAL GAS SYSTEM (Coastal Corp.) 608 miles, 30-24-in. from Mobile County, Ala. to Martin County, Fla. Ferc filed. $470 MM. Completion: late 1991.

TEXACO USA. 11 miles, 10&4-in. Green Canyon Block 6. Contractor: McDermott. Completion: August 1989.

***TEXAS GAS TRANSMISSION.** 70 miles, 20-in. from Bedford, Ind. to Indianapolis, Ind. under construction. Contractor: RB Potashnick. Completion: Dec. 1988.

59 miles, 16-in. from Perry County, Ind. to Bedford, Ind. Contractor: Sheehan. Completion: 1988.

3.4 miles, 20-in. in Breckinridge County, Ky. Contractor: Sheehan. Completion: 1988.

1.1 mile, 8-in. in Madison County, Tenn. Completion: 1988.

1.6 miles, 3-in. in Phillips County, Ark. Completion: 1988.

10.6 miles, 4-2-in. in Lawrence County, Ind. Completion: 1988.

3.2 miles, 20-in. in Vanderburg County, Ind. Planned. Completion: 1989.

***TRANSCONTINENTAL GAS PIPELINE CORP.** 25 miles, 20-in. from south Marsh Island Block 174, La. to Block 106, La. Completion: Dec. 1988.

7 miles, 20-in. Woodbury, NJ lateral loop. Contractor: Associated. Completion: Nov. 1988.

UNITED GAS PIPELINE. 2 miles, 24-in. in Norco, La. Planned.

4 miles, 6-in. in New Orleans, La. Planned.

2 miles, 20-in. in Polk County, Tex. Planned.

1 mile, 20-in. in Panola County, Tex. Planned.

2 miles, 4-in. in Jasper County, Tex. Planned.

***VIRGINIA ELECTRIC & POWER CO.** 80 miles, 24-in., 40 miles, 10-in. from Richmond, Va. to James City County, Va.

WYCAL-Wyoming-California Pipeline Co. (Coastal Corp.). 1,000 miles, 16-36-in. from Rocky Mountain Overthrust Belt, sw Wyoming to near Bakersfield, Calif. Ferc: environmental impact statement. Completion: 1989.

YUKON PACIFIC CORP. 820 miles from Prudhoe Bay to Kenai Peninsula. Proposed.

ALGERIA

SONATRACH. 239 miles, 34-in. loops on crude line from Hooud el Hanra to Skikda. Contractor: Saipem. Completion: mid 1989.

ANGOLA

***CHEVRON OVERSEAS.** 27.8 miles, 6-20 in. gas and crude lines from Numbi field to Takula field. Under negotation. Completion: late 1989.

7.4 miles, 8-12-in. crude and gas lines from Takula ALP platform to GSN platform. Contractor: McDermott. Completion: Oct. 1989.

AUSTRALIA

***QUEENSLAND GOVERNMENT.** 330 miles, 12.2-in. gas line to connect Surat basin and Denison Trough gas fields, southeast Queensland. Bids out. $100 MM.

ESSO AUSTRALIA LTD. 11 miles, 8-in. crude line from Tarwhine to Barracouta. Planned. Completion: 1989.

7 miles, 6-in. crude line from Seahorse to Barracouta. Planned. Completion: 1989.

8 miles, 8-in. gas line from Whiting to Snapper. Planned. Completion: 1989.

8 miles, 10-in. crude line from Whiting to Snapper. Planned. Completion: 1989.

BANGLADESH

BANGLADESH OIL, GAS, AND MINERALS CORP. 117 miles, 20-in. gas line from Kailashtila to Ashanganj. Design stage. Consulting: Pencol. Completion: 1990.

BELGIUM

DISTRIGAZ.

Gas lines under study.

8 miles, 24-in. from St. Martens-Bodegem to Anderlecht. Completion: 1989.

5 miles, 10-in. from St. Gilles-Waas to St. Niklaas. Completion: 1989.

2 miles, 10-in. from Zellik to Groot-Bijgaarden. Completion: 1989.

BOLIVIA

***YPFB.**

346 miles gas line from Santa Cruz to the Brazilian border. Planned.

284 miles, 10-in. and 202.6 miles, 6-in. gas lines from Santa Cruz to Altiplano under construction. Contractor: Protexa-Mexico on 10-in. line. $98.6 MM. Completion: Dec. 1988.

BRAZIL

PETROBRAS. 180 miles, 16-in. products and alcohol line from Guararema to Volta Redonda. Completion: July 1989.

75 miles, 20-in. gas line from Cabiunas to Rio de Janeiro under construction. Contractor: Techint. Completion: Jan. 1989.

67 miles, 20-in. crude oil line from Cabiunas to Duque de Caxias Station, RJ. Completion: Dec. 1988.

CANADA

PRODUCTS LINES

***FEDERATED PIPELINES LTD.** 40 miles, 10-in. from Bonnie Glen, Alta, to Namao, Alta. Completion: Nov. 1988.

GAS LINES

CANADIAN WESTERN NATURAL GAS. 6 miles, 6-in. from Coalhurst to Lethbridge. Planned. Completion: 1989.

POLAR GAS PROJECT. 1,318 miles, 36-in. from Canadian Mackenzie Delta/Beaufort Sea to Edson, Alberta. Filed with NEB. Completion: late 1990's.

SABLE GAS SYSTEMS (TransCanada Pipelines, Nova Scotia Resources). 490 miles, 26-in. from Sable Island through Nova Scotia and New Brunswick to Maine Border. Proposed.

TRANSCANADA PIPELINES LTD. 22 miles, 36-in. loop line between Ancaster and Niagara, Ontario, under construction.

*12 miles, 36-in. loop line near Cornwall, Ontario, under construction. Contractor: Majestic. Completion: Nov. 1988.

***TRANSGAS LTD.** 245 miles, 16-in; 10 miles, 10-in; 25 miles, 8 & 6-in. gas lines from Bronson Lake to Tuberose under construction. Completion: Nov. 1988.

19 miles, 16-in; 8 miles, 12-in; 10 miles, 10-in. from Golden Prairie to Liebenthal under construction. Completion: Nov. 1988.

WESTCOAST ENERGY INC. 12 miles, 10-in. on Umbach line. Completion: Nov. 1988.

7 miles, 6-in. on North Jedney extendion. Completion: Nov. 1988.

330 miles, 10-in. Vancouver Island. Planned. Completion: 1990.

CHILE

***SOCIEDAD NACIONAL de OLEODUCTOS LTD.** 11 miles, 4-in. jet fuel line from Maipú, Chile to Pudahuel, Chile. Under study.

CHINA

620 miles, 24-in. gas line from Yacheng field, Hainan Island to Guangdon Province, Guangzhou, south to Hong Kong. Feasibility study: Fluor Daniel PRC Ltd.

Qiong Zhou Strait crossing (Yacheng, Hainan, Hong Kong gas line). Joint study by: China National Offshore Oil Corp. and J.P. Kenny, London.

155 mile crude line from Shengli field to Huangdao, Shandong province. Eng-construction: Novacorp International.

230 mile gas line from Zhongyaun, Henan Province to Cangzhou, Hebei Province. Contractor: Novacorp International.

CHINA, TAIWAN

CHINESE PETROLEUM CORP.

GAS LINES:

9 miles, 30-in. from Yungan LNG receiving terminal to Kangshan under construction. Contractor: BES. Completion: Dec. 1990.

176 miles, 26-in. from Kangshan to Hsinchu under construction. Contractor: BES. Completion: Dec. 1990.

33 miles, 24-in. from Kangshan to Kaohsiung Linhai Industrial Zone under construction. Contracor: BES. Completion: Dec. 1990.

20 miles, 8-in. from Chiayee to Dounan. Planned. Contractor: BES. Completion: Dec. 1989.

59 miles, 8-in. from Miaoli to Nantou. Planned. Contractor: BES. Completion: 1989.

COLOMBIA

ECOPETROL.

PRODUCTS LINES PLANNED:

18 miles, 6-in. from Medellin to Rionegro.

81 miles, 6-in. from Facatativa to Villavicencio.

20 miles, 12-in. from Sebastopol to Medellin.

GAS LINE PLANNED:

58 miles, 20-on. from Dibulla to Ballenas.

DENMARK

DANSK OLIE OG NATURGAS. 30 miles, 30-in. gas line from Tenlille to Torslande under study.

FRANCE

***GAZ DE FRANCE.** 67 miles, gas line from Etrez to Swiss gas network. Completion: end 1989.

STE. DU PIPELINE MEDITERANEE-RHONE. 94 miles, products line from La Mede (Bouches-du-Rhone) to Puget-sur-Argens (Var). Eng. study: OTP.

GABON

***SHELL GABON.** Crude oil lines in Rabi field under construction. Contractor: Mannesmann AGA. Completion: 1989.

GERMANY

ERDGAS-Verkaufs. 70 miles, 16-in. gas line from Rehden to Frenswegen planned.

***GASVERSORGUNG SUDDEUTSCHLAND.** 13 miles, 20-in. gas line from Saulgau to Pfullendorf planned. Completion: Oct. 1989.

37 miles, 28-in. gas line from Amerdingen

to Scharenstetten planned. Completion: Oct. 1990.

RUHRGAS AG. 68 miles, 36-in. gas line from Obermichelback to Amerdingen. Planned. Contractor: Pipeline Eng. Completion: 1989.

HUNGARY

***HUNGARIAN OIL AND GAS TRUST.** 73 miles, 31-in. gas line from Endród to Városföld planned. Contractor: Olajterv, Kóolajvezetéképitó Vállalat. Completion: 1989.

22 miles, 31-in. gas line from Pilisvörösvár to Dorog planned. Contractor: Olajterv, Kóolajvezeték Épitó Vállalat. Completion: 1990.

INDIA

INDIAN OIL CORP. LTD. 850 miles crude and products lines from port of Kandla, Gujarat State to Karnal refinery, Baholi, Haryana. Products on to Bhatinda, Punjab

NATIONAL GAS & PIPELINES CORP. 1,094 miles, 36-18-in. gas line from Bombay High to six (future) fertilizer plants. Route: Bombay High to Hazira to Jhabua to Bajaipur, (spur to Anta and Sawai Madhopur), to Auraiya (spur to Jagdishpur), to Shahjahanpour to Aonla to Babrala. $1.7 billion. Contractors: Spie-Capag, NKK Corp., TEC. Completion: July 1989. (Three stages complete).

IRAN

NIOC. 62.5 miles, 42-in. crude line from Gurreh to Taheri under construction. Eng: Snam Progetti. Contractor: Saipem. Completion: Nov. 1988.

IRAQ

IPSA-2. 602 miles, 48-56-in. crude line from Station 3 (Petroline) to export terminal near Yanbu, Red Sea coast under construction. Contractors: Saipem and Mitsubishi. Completion: Sept. 1989.

ITALY

SNAM SpA

GAS LINES PLANNED:

14 miles, 20-in. loop from Monfalcone to Villa Opicina.

GAS LINES UNDER CONSTRUCTION.

Loop of USSR import:

KOREA

68 miles, 20-24-in. gas line. Part of a $130 MM project for a gas feeder pipeline system to join a pipeline from LNG facilities at Pyeong Taek to Inchon.

MALAYSIA

PETRONAS. 375 miles, 24-36-in. crude line. Planned.

MEXICO

PEMEX.

CRUDE LINES

*164.7 miles, 48-in. from Nuevo Teapa, Ver. to Salina Cruz, Oax. Under construction.

39 miles, 16-in. from Imuris to Canonea. Contractor: Spie Capag.

PRODUCTS LINES

*37.3 miles, 24-in. from Venta de Carpio, Edo. de Mexico to Tulsa, Hgo. Under construction.

186 miles, 12-in. from Guadalajara, Jal to Tepic, Nay. Planned. Completion: Dec. 1988.

215 miles, 16-in. products line Naco to Hermosillo. Planned. Completion: Dec. 1989.

199 miles, 14-in. from Guadalajara to Manzanillo. Planned. Completion: Dec. 1989.

From Queretaro to San Luis Potosi. Planned. Completion: Dec. 1989.

GAS LINES

155 miles, 24-in. from Jaltipan, Ver. to Salina Cruz, Oax. Planned.

*18.6 miles, 16-in. from Matapionche, Ver. to Angostura, Ver. Engineering stage.

*12.4 miles, 14-in. from Angostura, Ver. to Tierra Blanca, Ver. Engineering stage.

*26.7 miles, 20-in. from Matapionche, Ver. to Paso del Toro, Ver. Engineering stage.

*236.2 miles, 48-in. from Veracruz, Ver. to Santa Ana, Hgo. Under construction.

NETHERLANDS

NV NEDERLANDSE GASUNIE. 19 miles, 8-in. gas line from Monster/Gaag to Kemma (Botlek) in engineering stage. Completion: Oct. 1990.

NIGERIA

***AGIP ENERGY & NATURAL RESOURCES and NNPC.** 12-in. line from Aghbara offshore field to Brass terminal, Rivers State.

NIGERIAN NATIONAL PETROLEUM CORP. 28 miles, 8-10-in. and 38 miles, 20-24-in. gas lines from West Niger Delta to Warri under construction. Consult: Pencol. Contractors: Mobilised and Mannesmann-Imeg. Completion: 1989.

50 miles, 30-in. gas line from Utorogu to Warri under construction. Consult: Pencol. Contractor: Entrepose. Completion: 1988.

215 miles, 30-in. and 23 miles, 20-in. gas lines from Warri to Lagos under construction. Consult: Pencol. Contractor: Saipem-Snamprogetti. Completion: 1988.

234 miles, 16-in. and 75 miles, 12-in. products lines from Port Harcourt, Enugu, Auchi to Benin City, Nigeria. Design stage. Completion: 1990.

SHELL NIGERIA. 26 miles, 24-in. crude line from Nkpoku to Bomu. Planned. Completion: June 1989.

NORWAY

STATOIL. 10 miles, 2-in. crude line from Veslefrikk to Oseberg. Contractors: Vallourec and Allseas. Completion: 1989.

25 miles, 36-in. gas line from Zeepipe Sleipner to Statpipe. Planned. Completion: 1993.

515 miles, 42-in. gas line from Zeepipe Sleipner, Norway to Zeebruge, Belgium. Planned. Completion: 1994-1995.

80 miles, 36-in. gas line from Zeepipe Troll to Heimdal. Planned. Completion: 1996.

95 miles, 42-in. gas line from Zeepipe Troll to Sleipner. Planned. Completion: 1996.

PAKISTAN

***SUI GAS TRANSMISSION CL.** 182 miles, 20-in. gas loops from Sui to Karachi. Design-engineering stage. Completion: Dec. 1990.

SWITZERLAND

GASVERBUND OSTSCHWEIZ. 16.8 miles, 10-in. gas line from Truebbach to Chur. Contractor: Stadt Chur. Completion: 1989.

13.9 miles, 10-in. gas line from Wattwil to Bilten (Glarus). Contractor: Stadt Glarus. Completion: 1989-90.

TANZANIA

TAZAMA PIPELINES LTD. 1,070 miles, 8-12-in. line from Dar-Es-Salaam to Ndola, Zambia. Design complete. Consulting: Pencol. Completion: 1990.

THAILAND

PETROLEUM AUTHORITY OF THAILAND. 437.5 miles, 22 or 18-in. gas line from Khonkaen Province to Chonburi Province. Planned. Completion: 1993.

121 miles, 32-in. gas line from offshore Texas Pacific field, Gulf of Thailand to Erawan field, Gulf of Thailand. Planned. Completion: 1992.

TURKEY

BOTAS. Extension of 496-mile gas line from Ankara to Izmir. Proposed.

UNITED KINGDOM

***BRITISH GAS CORP.** 8.5 miles, 24-in. gas line from Cotleigh to Ottery St. Mary. Planned. Completion: Oct. 1989.

15 miles, 36-in. from Easington to Paull. Planned. Completion: Aug. 1989.

***BP PETROLEUM DEV. LTD.** 56 miles, 16-in. crude line to Southampton area and 31 miles, 8-in. gas line to Sopley, Hampshire from Wytch Farm area. $28.5 MM. Contractor: Press Const.

***BP and TOTAL OIL MARINE.** 15 miles, 12-in. link of St. Fergus gas line to Forties system at Cruden Bay. Contractor: Norwest Holst.

***CATS-Central Area Transmission System.** (40% Gas Council Exploration Ltd., 30% Amoco UK Exploration, 18% Amerada Hess, 12% Texas Eastern North Sea Inc.). $1.8 billion central UK North Seas gathering system in detailed design study. Completion: 1993.

VENEZUELA

CORPOVEN SA. 373 mile products line from Puerto la Cruz refinery to Maturin, San Tome, Ciudad Bolivar, Puerto Ordaz, Puerto Ayacucho.

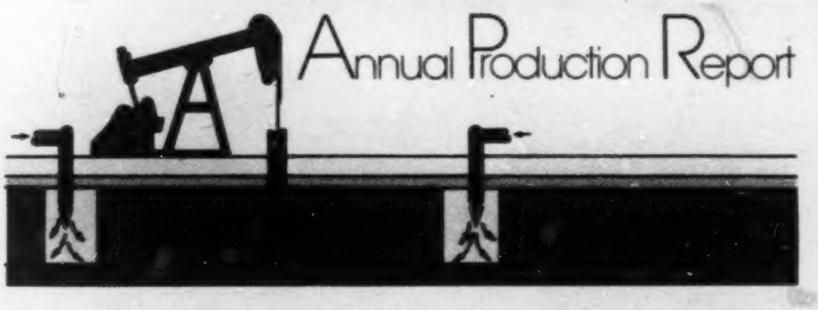
MARAVEN SA. Sumandes products line from San Lorenzo, Lake Maracaibo to El Vigia and Tachira (Andes). Planned. $213 MM. Completion: 1990.

YEMEN

YEMEN GOVERNMENT and USSR. 105-125 mile crude line from new fields in the Shabwa area to Bir Ali coastal terminal. Agreement signed.

ZAMBIA

TAZAMA PIPELINES LTD. 1,070 miles, 8-12-in. from Dar-Es-Salaam, Tanzania to Ndola. Design complete. Consulting: Pencol. Completion: 1990.



EOR projects decline, but CO_2 pushes up production

L.R. Aalund
Technology Editor

Although U.S. enhanced oil production was still rising in early 1988, enhanced oil recovery (EOR) has obviously suffered from the crude oil price collapse of 1986.

This is evident in the Journal's worldwide, biennial EOR survey when compared with the previous one conducted in late 1985 and early 1986, largely before it was evident a new oil era had arrived. However, the 1988 survey also shows that a noteworthy amount of investment is still targeted for EOR projects in the U.S. and Canada.

The mass of data presented in the tables in this section boils down to reveal that the number of U.S. EOR projects has decreased markedly, but production was at the 637,000 b/d level the first of this year (Table 1). This is a 5.4% gain over the level for the same time in 1986. The production trend is presented in Fig. 1.

Looking at the U.S. on the basis of total EOR projects of all kinds, the survey reveals that the number declined from 512 in 1986 to 366. This is a loss of 146 or a decline of some 28%. Table 2 breaks down the active projects by type in the four main EOR categories. In some cases operators combined a number of projects and shortened the list or shut down pilot operations for reasons that may have had nothing to do with the price of crude oil. However, in contrast to the trend in projects going generally up since 1971, the year the Journal conducted its first EOR survey, the direction since 1986 has been a thunderous down.

Nevertheless, investment data available for 76 projects planned for 1988 and 1989 in the U.S. and in foreign fields show that $960 million is expected to be spent on EOR projects during the 2 year period. The projects marked with an asterisk in Tables A and B are the ones where investment figures were available and are the source of this total.

Fig. 1

EOR production climb moderated

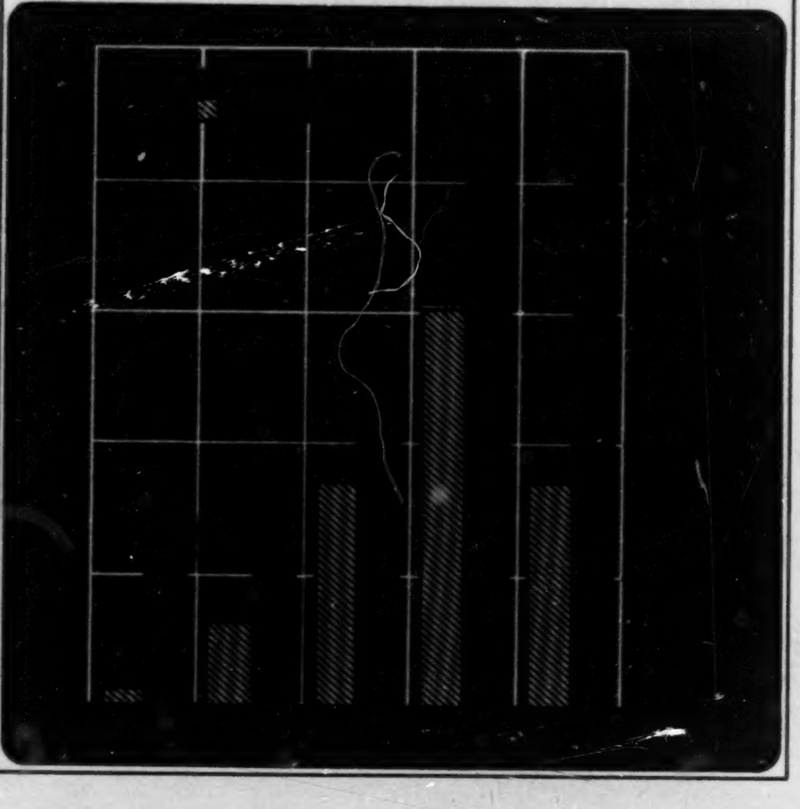
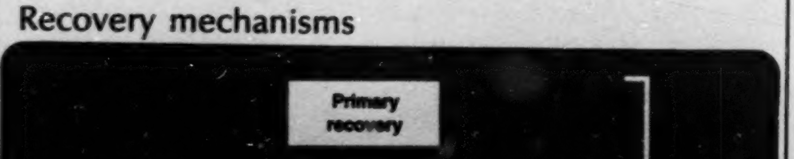


Fig. 2

Recovery mechanisms



Scope, guide. The intent of the Journal's biennial survey is to report, among other things, the additional production that would not be available from a reservoir unless it was stimulated by added energy by means of, for example, steam or carbon dioxide injection. The accompanying diagram, Fig. 2, represents the various recovery mechanisms. The intent of the Journal survey is in general only to cover the bottom tier of mechanisms, i.e., thermal, gas, chemical, and others.

But it must be emphasized that this diagram represents a traditional production sequence. There are, for example, reservoirs that skip the primary stage shown in the diagram and begin production with the assistance of injected natural gas or water. The intended scope of this survey and some of the complexities involved in defining enhanced oil recovery are discussed in the accompanying box.

As an aid to locating different types of information in the massive tables, which are lettered instead of numbered, a guide is also presented in this section listing the content of each table and the abbreviations used.

Outside the U.S. Venezuela and Canada both have lively EOR programs. Canada had 75 active projects as of the first of this year. They are reported in Table C.

Reported enhanced production in Canada is 148,000 bo/d with 42 hydrocarbon miscible projects accounting for 115,000 bo/d of that.

Venezuela has fewer and less diverse projects but is the hemisphere's second largest EOR producer with 216,000 bo/d. Details on these and other foreign projects are listed in Table D.

Unfortunately, up-to-date data covering one of the world's major steam flood projects could not be obtained. That is P.T. Caltex Pacific Indonesia's steam project in the Duri field of Sumatra. It has lifted production there by about 65,000 bo/d. Original plans called for the project to cover the entire field and to lift production from 40,000 bo/d to some 300,000 bo/d by 1985. The pace of the originally planned program is apparently falling short of that but the project could still become one of the world's largest.

Another major project was announced for Brazil last year. Petroleo Brasileiro SA says it plans to inject CO_2 in Aracas field in Bahia and boost recovery by 5.3 million bbl of oil in 14 years. This project is not yet listed in planned foreign projects.

U. S. EOR production

As Table 1 shows, enhanced production from thermal projects de-

Abbreviations

Formation type

S: Sandstone
LS: Limestone
Dolo.: Dolomite
Congl.: Conglomerate
Tripol.: Tripolite
US: Unconsolidated sand

Project maturity

JS: Just started
HF: Half finished
NC: Nearing completion
C: Completed
PP: Postponed
Term.: Terminated

Previous production

Prim.: Primary
WF: Waterflood

Project evaluation

TETT: To early to tell
Prom.: Promising
Succ.: Successful
Disc.: Discouraging
None: Not evaluated

Project scope

P: Pilot project
FW: Field wide
LW: Lease wide
RW: Reservoir wide
Exp. L: Expansion likely
Exp. UL: Expansion unlikely

Defining EOR

By some definitions, determining whether a particular production operation is enhanced oil recovery or not should be relatively straightforward. It is not.

First, it is generally agreed that "enhance" means to make something that already exists or is happening better. Therefore, reservoirs that have never produced oil and that do not flow by natural pressure or that must be heated to be pumped are not having their production "enhanced" by stimulation. Therefore, they should not be designated as EOR projects. Canada has over 20 such projects. The viscosity of the reservoir oil in most of these projects ranges from 25,000 to 800,000 cp at temperatures in the range of 55-70° F. Most are designated experimental heavy oil projects. They are not listed in the Journal's survey.

A problem of semantics arises, however, because many nonflowing, heavy-oil reservoirs are being stimulated by combustion or steam injection. These are definitely recognized as EOR processes. That means an EOR process can be used on a project that should not bear the designation of an EOR project.

Earlier, another definitional trail was blazed with useage of the terms primary, secondary, and tertiary recovery. That approach is shown in the accompanying Fig. 2 and has some merit if one keeps in mind that it has some exceptions and it represents the traditional concept of EOR. With world crude heading toward its price spike in the early 1980s, the practicality of starting primary commercial production with a tertiary process was in general an idea that got better as the price of crude increased.

The National Petroleum Council in its 1984 study "Enhanced Oil Recovery" defined EOR for the purposes of the study as:

"The incremental ultimate oil that can be economically produced from a petroleum reservoir over that which can be economically recovered by conventional primary and secondary methods. Primary methods rely on the natural reservoir energy to drive the oil through reservoir rock to the production well. Over time, this natural energy drive dissipates, and energy must be added to the reservoir to produce significant amounts of additional oil."

That is a lucid and sensible definition that has utility. But later in discussing the scope of the study the NPC says certain EOR processes have been referred to as tertiary processes.

A following statement then puts the neat preceding definition of EOR in jeopardy:

"However, the term 'enhanced oil recovery,' as used in this report, is considered to have a broader meaning than 'tertiary oil recovery,' in that potential from reservoirs that are not suitable for the application of conventional and primary and secondary techniques is included."

That statement then bumps up against the accepted meaning of "enhanced," and requires some qualification.

The thrust of the Journal surveys has been, and still is, to cover projects fitting the first part of the NPC definition. We are confident that essentially all of our respondents understood our intent and that the survey faithfully reflects this.

The processes listed at the bottom of the diagram of recovery mechanisms, Fig. 2, under thermal, gas, and chemical, are the ones Journal respondents were asked specifically to identify. They had the option of also listing a number of of minor processes under the "other" category and designating them by type. Respondents listed the five different types shown.

Finally, it should be noted that the word "project" is used in this report to mean that the operation is moving toward a goal of recovering a certain amount of oil.

clined, while chemical and gas projects logged increases.

Of total EOR U.S. production in 1988, thermal output accounted for 72.9% compared to 79.3% in 1986; chemical output was 3.5% compared to 2.8% in 1986; and gas production was 23.6 vs. 17.9%

The most barrels of EOR production lost was in the steam category and most of that was in venerable California fields. Table H shows steam and other type projects terminated or completed since the 1986 survey. California steam projects were obviously pummeled by low crude prices.

One small California producer with a 160-acre project started in 1965 was employing 34 producers and 20 injector wells to make 140 b/d of 13° API oil.

He shut down the project in 1986 because he needed $14/bbl to stay in operation but was only getting $9/bbl.

A production manager working for a larger company in Kern County, Calif., reported earlier this year that he had turned off the steam, his reservoir had cooled down, and he was "just pumping the dregs" trying to keep the office open a bit longer. This operation was getting \$12 to \$13/bbl for crude of 13 to 16° API gravity oil. However, this manager reported that in December 1987 his lease costs were running \$21/bbl. That is how much he would need per barrel to break even.

But steam EOR is also characterized by huge projects. The largest of all steam projects is Shell Oil's Belridge project in California making 101,000 bo/d. Second largest is Texaco's Kern River project with 87,600 bo/d. These two projects account for 41% of the steam enhanced production in the U.S.

Steam EOR is also a key element in what is perhaps a unique EOR project. A \$125 million, 49.5×10^6 w coal-fired cogeneration plant is under construction on a 5-acre site about 12 miles north of Bakersfield, Calif. The coal will come by train from Utah. The steam produced will be used for generating electricity and for injection in leases that Macpherson Oil Co. operates in the nearby Mt. Poso field. Macpherson is also co-owner of the cogeneration facility.

The company says that primary recovery from the Mt. Poso field, west area, is now 30% of the original oil in place and that the thermal operations will increase total expected recovery to in excess of 60%.

Table A

U.S. planned EOR projects by type

Operator	Project type	Field	State	Size, acres	Pay zone	Depth, ft	Gravity, °API	Target date
Mobil*	Alkaline	Luling	Tex.	200	Edwards Limestone	2,100	28.0	6/89
Nat. Coop. Refinery Assn.*	Alkaline/polymer	W. Moorcroft	Wyo.	640	Muddy 55	3,600	32.0	5/88
Mobil	CO_2	Postle	Okla.	23,000	Morrow	6,200	40.0	1991
Mobil*	CO_2	Shiloh	Tex.	3,900	Upper Pettit	7,100	38.0	12/89
Amoco*	CO_2 miscible	Lost Soldier	Wyo.	1,400	Tensleep	5,000	35.0	1988
Amoco*	CO_2 miscible	Anton Irish	Tex.	8,545	Clearfork	5,900	28.0	1989
Amoco	CO_2 miscible	Slaughter	Tex.		San Andres	4,950	27.0	
Chevron*	CO_2 miscible	North Ward Estes	Tex.	3,840	Permian Yates	2,900	37.0	4/89
Conoco	CO_2 miscible	E. Huntley	Tex.	1,308	San Andres	3,180	36.0	1989
Conoco	CO_2 miscible	W. Sussex	Wyo.	1,740	Shannon	3,040	38.0	1991
Conoco	CO_2 miscible	North El Mar	N.M.	2,000	Delaware	4,600	41.0	1989
Conoco	CO_2 miscible	McCallum	Colo.	813	Pierre 'B'	800	28.0	Late 1988
Conoco	CO_2 miscible	Maljamar	N.M.	3,840	Grayburg/San Andres	3,565	38.0	1/88
Mobil*	CO_2 miscible	Slaughter	Tex.	2,495	San Andres	4,900	32.0	7/89
Texaco*	CO_2 miscible	Wasson	Tex.	13,655	San Andres	5,100	33.0	6/89
Texaco*	CO_2 miscible	Paradis	La.	44	9500-Foot	9,800	38.0	3/88
Texaco*	CO_2 miscible	Paradis	La.	160	16 Sand	9,900	38.0	7/88
ARCO Alaska*	HC immiscible	Kuparuk River	Alaska	7,680	Kuparuk A & C	6,000	24.0	3/88
ARCO Alaska*	HC miscible	Prudhoe Bay	Alaska	4,000	Sadlerochit	8,800	27.0	9/88
ARCO Alaska*	HC miscible	Prudhoe Bay	Alaska	5,000	Sadlerochit	8,800	27.0	9/89
ARCO Alaska*	HC miscible	Kuparuk	Alaska	5,120	Kuparuk	6,000	23.0	6/88
Kerr-McGee*	HC miscible	North Buck Draw	Wyo.	4,800	Dakota	12,500	45.0	10/88
Louisiana Land & Expl.*	HC miscible	Buck Draw	Wyo.	4,800	Dakota	12,500	46.0	1/89
Texaco	Hot water	San Ardo	Calif.	130	Aurignac	2,200	13.0	7/89
ARCO	Polymer	Dundee Healdton Unit	Okla.	660	Penn	1,000	31.0	1988
Citronelle Unit*	Polymer	Citronelle	Ala.	160	Rodessa	10,600	42-45.0	Open
Enron Oil & Gas*	Polymer	Big Piney	Wyo.	2,789	Mesaverde	3,500	44.0	7/87
Mitchell Energy*	Polymer	Alba	Tex.	512	Sub-Clarksville	4,010	15.5	7/87
Sun E&P*	Polymer*	Dora Roberts	Tex.	150-700	San Andres	2,100	29.0	3/88
Sun E&P*	Polymer*	Stephens County Regular	Tex.	1,000	Caddo	3,200	35.0	4/88
Texaco*	Polymer	Inglewood	Calif.	20	VMR	2,800	18.0	7/89
Unocal*	Polymer	Hueneme	Calif.	135	Hueneme	5,400	14.0	1/89
Chevron*	Steam	Midway Sunset	Calif.	22	Sub Lakeview	1,000	11.0	1989
Chevron*	Steam	Coalinga	Calif.	150	Temblor	950	13.0	1989
Chevron	Steam	Coalinga Sec. 31A	Calif.	100	Temblor	900	14.0	1/87
Chevron*	Steam	Whittier	Calif.	10	1st Zone	1,000	15.0	1988
Chevron*	Steam	Homer	La.	40	Nacotoch	1,250	37.0	4/89
Chevron*	Steam	Coalinga	Calif.	100	Temblor	900	14.0	1988
DCR Petroleum*	Steam	Camp Hill	Tex.	35	Carrizo	400	18.4	7/88
DCR Petroleum*	Steam	O'Connell	N.M.	1.2	O'Connell	350	17.0	5/88
DCR Petroleum*	Steam	T-4	N.M.	1.2	O'Connell	700	17.0	5/88
Lawrence-Allison*	Steam	Teapot Dome NPR-3	Wyo.	60	Shannon	300	33.0	10/88
M.H. Whittier*	Steam	Coalinga	Calif.	25	Temblor	1,500	14.0	1/89
MacPherson Oil*	Steam	Mt. Poso	Calif.	243	Bedder	2,200	16.0	1989
Mobil	Steam	Midway Sunset	Calif.	20	Monarch	950	13.0	1988
Mobil*	Steam	North Midway Sunset	Calif.	300	Potter	1,200	12.0	1/89
Mobil*	Steam	Talco	Tex.	5	Paluxy	4,300	19.0	6/88
Mobil	Steam	West Newport	Calif.	12	A Zone	600-1,450	13.0	1/88
Mobil*	Steam	Bayou Bleu	La.	22	Sch. No. 1 RD	1,500	18.0	12/89
Mobil*	Steam	Bayou Bleu	La.	140	Sch. No. 1 RA	1,700	18.0	2/88
Oxy USA	Steam	South Kern Front	Calif.	80	Etchegoin chanac	1,500	14.0	1/90
Oxy USA	Steam	North Kern Front	Calif.	342	Etchegoin	1,300-1,500	14.0	1/89
Tenneco*	Steam	Midway-Sunset	Calif.	15	Metson	1,400	12.0	1988
Tenneco*	Steam	Placerita	Calif.	55	L. Kraft	1,800	12.0	1988
Tenneco*	Steam	Kern River	Calif.	24	Kern River	600	13.5	1988
Texaco*	Steam	San Ardo	Calif.		Lombard	1,900	11.0	
Texaco*	Steam	Kern River	Calif.	111	Kern River Series	1,000	13.0	9/88
Texaco*	Steam	Cat Canyon	Calif.	800	S1B	2,500	10.0	4/88
Texaco*	Steam	Midway	Calif.	12	Potter	1,000	13.0	1/89
Texaco*	Steam	Poso Creek	Calif.	55	Basal Etchegoin	2,400	12.3	2/88
Texaco*	Steam	McKittrick	Calif.	12	Potter	1,100	13.0	1/89
Texaco*	Steam	Cat Canyon	Calif.	460	S2-S8	2,600	10.0	4/88
Texaco*	Steam	Sour Lake	Tex.	5	Miocene	1,400	18.0	1/88
Texaco*	Steam	Midway	Calif.	5	Potter	950	12.0	7/88
Union Pacific Resources*	Steam	Wilmington	Calif.	95	Tar	2,500	14.0	1/89
Unocal*	Steam	Cymric (Walport)	Calif.	80	Tulare	1,200	13.0	1989
Unocal	Steam	Cymric	Calif.	150	Antelope Shale	2,400	13.0	1989
Unocal*	Steam	Midway Sunset	Calif.	16	Hoyt	1,750	13.0	6/88
Unocal*	Steam	S. Tapo Canyon	Calif.	15	4th Sespe	2,100	16.0	3/88
Unocal	Steam	Brea	Calif.	150	Pliocene	2,500	16.0	1990

*Project for which investment data were available.

Polymer. Although there was a major drop in polymer projects during the period 1986-1988, there was a healthy gain in output (Table 1 and Table G).

The reasons are that of the some 80 polymer projects shut down since 1986 over half of them had not previously reported any enhanced production. Prior to 1986, with the higher price of crude there was an incentive to launch projects to escape the windfall profit tax with enhanced production. Secondly, there are now simply more larger projects. There are seven capable of over 1,000 b/d in this compilation vs. only two in 1986. The largest is Marathon Oil's Oregon basin, Wyo., Setpa project rated at 3,000 b/d of enhanced production.

Carbon dioxide. The large jump in CO_2 miscible EOR of nearly 36,000 bo/d, representing a 125% increase over 1986, has been in the offing since three large trunk lines began transporting Colorado and New Mexico carbon dioxide into the Permian basin in 1984. Table F includes details on existing CO_2. The three major pipelines moving CO_2 into the Permian basin are the 30-in. Cortez line operated by Shell Pipe Line Co., the 24-in. Sheep Mountain line operated by ARCO, and the 20-in. Bravo Dome line operated by Amoco Pipeline Co. The latter brings in the gas from New Mexico.

All three terminate in the Denver City, Tex., area. Further pipeline construction within the basin has spurred carbon dioxide EOR projects in the area.

Enron has built the Central Basin line stretching from the Denver City area in Yoakum County some 150 miles south to the Yates field in Pecos County. It ties in to the 16-in. Sacroc CO_2 line which could be tied in and make a major source of CO_2 available to an even larger part of West Texas. Chevron's Sacroc line originally took carbon dioxide from a Pecos County

Guide to EOR project tabulations

Table A: U.S. planned EOR projects by type
Table B: Planned projects outside U.S. by country
Table C: Producing Canadian EOR projects
Table D: Producing EOR projects outside U.S. and Canada
Table E: Producing thermal-EOR projects in U.S.
Table F: Producing CO_2, gas-EOR projects in U.S.
Table G: Producing chemical-EOR projects in U.S.
Table H: Completed, terminated U.S. projects

Table B

Planned projects outside U.S. by country

Operator	Project type	Field	Country	Size, acres	Pay zone	Depth, ft	Gravity, °API	Target date
Vikor	CO_2 miscible	Joffre	Canada/Alta.	640	Viking - Phase II	5,000	42.0	1988
Shell Canada*	CO_2 miscible	Harmatton East	Canada/Alta.	2,210	Turner Valley	8,600	38.6	Mid 1988
Canada Northwest Energy*	Electromagnetic heating	Frog Lake	Canada/Alta.	120	Sparky	1,500	12.0	9/88
Amoco Canada*	HC miscible	Pembina	Canada/Alta.	1,400	Cardium	5,100	38.0	Mid 1989
Amoco Canada*	HC miscible	Nipisi	Canada/Alta.	8,640	Gilwood	5,500	41.0	4/88
Canada Northwest Energy*	HC miscible	Morinville	Canada/Alta.	160	D3	5,200	28.0	4/89
Canterra Energy*	HC miscible	Bigoray K	Canada/Alta.	200	Nisku	7,500	35.0	Mid 1988
Canterra Energy*	HC miscible	Rainbow South S	Canada/Alta.	100	Keg River	6,000	42.0	Mid 1988
Chevron Canada	HC miscible	Bigoray D	Canada/Alta.	400	Nisku D	11,000	38.0	1/89
Chevron Canada	HC miscible	Brazeau River I	Canada/Alta.	250	Nisku I	10,000	45.0	3/88
Chevron Canada*	HC miscible	Kaybob	Canada/Alta.	4,100	Beaverhill Lake A	10,000	36.0	7/88
Chevron Canada	HC miscible	Mitsue	Canada/Alta.	2,132	Gilwood-Stage 1 Expan.	5,000	41.0	7/88
Chevron Canada	HC miscible	Mitsue	Canada/Alta.	5,152	Gilwood-Stage 3	5,000	41.0	7/89
Gulf Canada*	HC miscible	Fenn-Big Valley	Canada/Alta.	2,246	Nisku	5,249	32.8	1989
Gulf Canada*	HC miscible	Fenn-Big Valley	Canada/Alta.	3,000	Nisku	5,249	32.8	1991
Gulf Canada*	HC miscible	Fenn-Big Valley	Canada/Alta.	1,300	Nisku	5,249	32.8	1992
Home Oil*	HC miscible	Swan Hills	Canada/Alta.	8,240	Beaverhill Lake	8,700	39.0	5/88
Mobil Oil Canada*	HC miscible	Carson Creek North	Canada/Alta.	5,760	Beaverhill Lake	8,700	43.7	Late 1989
Shell Canada*	HC miscible	Virginia Hills	Canada/Alta.	6,080	Beaverhill Lake	9,200	38.0	Late 1989
Canada Northwest Energy*	Steam	Atlee Buffalo	Canada/Alta.	40	Glauconite	2,900	14.5	1/89
Mobil Oil Canada	Steam	Cold Lake	Canada/Alta.	160	Lower Grand Rapids	1,200	12.0	3/88
Norcen*	Steam	Cold Lake	Canada/Alta.	50	Clearwater	1,450	11.0	12/88
Suncor*	Steam	Burnt Lake	Canada/Alta.	660	Clearwater	1,600	11.0	
Canade Northwest Energy*	Electromagnetic heating	Tangleflags	Canada/Sask.	80	Sparky	1,700	13.8	4/88
Canada Northwest Energy*	Electromagnetic heating	Northminster	Canada/Sask.	160	Sparky	1,750	14.9	4/88
Mobil Oil Canada	Steam	Celtic	Canada/Sask.	160	Gen. Petroleum/ Waseca	1,650	12.0	1988
Phillips Petroleum	Steam	Coleville	Canada/Sask.		Bakken	2,600	14.0	1989
NKFV	C_2 rich gas inj.	Algyo	Hungary	400	Tisza-2	5,700	47.0	1988
OKGT	CO_2 gas cap	Nagylengyel	Hungary	3,000	I-IV Rudistid	6,000	27.0	1988
NKFV	Steam	Demjen-West	Hungary	15	Rupelien 3/B	1,000	30.0	1988
Trintoc*	Steam	Point Fortin	Trinidad	30	Cruse Sands	1,600-1,800	16-18.0	1988
Trintoc*	Steam	Forest Reserve	Trinidad	52	Forest Sands	1,000-1,200	16-18.0	1989
Corpoven	Steam	El Pao	Venezuela	15	U-1,2,3	1,800	8.5	6/88
Mobil Oil AG*	Polymer	Voigtei	West Germany	870	Cornbrash	1,300-1,600	35.0	1989
BEB	Steam	Ruhlermoor SD 3	West Germany/ Emsland	370	Valanginian	1,670-2,165	25.0	1988
Wintershall AG*	Hot water	Emlichheim	West Germany/ Saxony	430	Valenginien	2,600	24.5	1988

*Project for which investment data were available.

Table 1

U.S. EOR production

	b/d					Change from 1986, %
	1980	1982	1984	1986	1988	
Thermal						
Steam	243,477	288,396	358,115	468,692	455,484	−2.8
Combustion in situ	12,133	10,228	6,445	10,272	6,525	−36.5
Hot water	—	—	—	705	2,896	+310.8
Total thermal	**255,610**	**298,624**	**364,560**	**479,869**	**464,905**	**−3.1**
Chemical						
Micellar-polymer	930	902	2,832	1,403	1,509	+7.6
Polymer	924	2,927	10,232	15,313	20,992	+37.1
Caustic/alkaline	550	580	334	185	0	−100.0
Total chemical	**2,404**	**4,409**	**13,398**	**16,901**	**22,501**	**+33.1**
Gases						
Hydrocarbon miscible/immiscible	—	—	14,439	33,767	25,935	−23.2
CO_2 miscible	21,532	21,953	31,300	28,440	64,192	+125.7
CO_2 immiscible	—	—	702	1,349	420	−68.9
Nitrogen	—	—	7,170	18,510	19,050	+2.9
Flue gas (miscible and immiscible)	—	—	29,400	26,150	40,450	+54.7
Total gases	**74,807**	**71,915**	**83,011**	**108,216**	**150,047**	**+38.7**
Other						
Carbonated waterflood	—	—	—	—	—	—
Grand total	**332,821**	**374,948**	**460,969**	**604,786**	**637,453**	**+5.4**

gas processing plant to Kelly-Snyder and Diamond M fields in Scurry County, Tex.

Big Three Industries Inc.'s West Texas Carbon Dioxide Pipeline is also taking carbon dioxide south from the Denver City area. It terminates at another CO_2 line laid to transport carbon dioxide to Conoco's Ford Geraldine field in Reeves County. The route of this pipeline opened another part of the Permian basin to CO_2 EOR.

This will be a major factor there for the next 20 to 30 years, and with so much infrastructure in place it is likely production will rise even as the price of crude languishes. With a little help from oil markets, this region could "go critical" in CO_2 EOR activity and production.

Carbon dioxide, which can in the wrong location still spoil the economics of a gas field, is becoming a valuable commodity, certainly in West Texas. Other oil regions, like the Canadian province of Saskatchewan, would also welcome an abundent and affordable source of CO_2.

Amoco Corp., for example, now gives carbon dioxide reserves and production figures in its annual report. Production last year was 222 MMcfd compared to 33 MMcfd in 1984.

Amoco is also tapping other sources of carbon dioxide in West Texas. It has a plant in the Wasson field in the Permian basin separating carbon dioxide for injection from natural gas. It has two separation plants (one nearing start-up early last month) in the nearby Slaughter field even though the Bravo line cuts right through this field.

The Permian basin is now the world leader in CO_2 EOR. Even further infrastructure for EOR production is being added. Chevron U.S.A. kicked off the world's first CO_2 EOR in 1972 at the Sacroc unit, but earlier this year announced a three stage project for the North Ward Estes field of Ward and Winkler Counties, Tex. The new project could ultimately recover 65 million bbl of oil and 32 bcf of gas with a miscible carbon dioxide EOR project.

Producing Canadian EOR projects*

Operator	Field	Province	Start date	Area, acres	Number wells – Prod.	Number wells – Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Alkaline										
Dome Petroleum	David	Alta.	1986	245	22	7	Lloydminster	S	29.0	1,480
CO_2 miscible										
Shell Canada	Midale	Sask.	10/85	5	3	4	Midale	LS/Dolo.	16.0	3
Vikor	Joffre Viking	Alta.	12/82	320	5	5	Viking	S	13.0	500
Vikor	Joffre Viking	Alta.	8/85	640	6	3	Viking	S	13.0	500
Caustic										
Dome Petroleum	Cessford	Alta.	7/84	680	19	7	Basal Colorado	S	24.0	350
Caustic-polymer										
Pancanadian	Horsefly Lake	Alta.	12/84	34	5	4	Lower Mannville	S	18.0	260
Combustion										
Husky	Tangleflags	Sask.	1985	240	19	3	GP	US	33.0	4,000
Mobil Oil Canada	Battrum	Sask.	10/66	4,920	87	13	Battrum/Roseray	S	26.0	1,265
Mobil Oil Canada	Battrum	Sask.	8/67	2,400	47	5	Battrum/Roseray	S	25.0	930
Mobil Oil Canada	Kitscoty	Alta.	1977	1,040	84	7	Sparky	S	34.0	2,000
Mobil Oil Canada	Fosterton Northwest	Sask.	1/70	200	6	4	Roseray	S	29.0	958
Mobil Oil Canada	Battrum	Sask.	11/65	680	24	3	Roseray	S	27.0	930
Pancanadian	Countess Upper Mannville B Pool	Alta.	1/83	40	4	2	Glauconite S.S.	S	25.0	800
Murphy	Evehill	Sask.	9/81	180	16	9	Cummings Waseca	S	34.0	6,000
Electromagnetic heating										
Canada Northwest Energy	Wildmere	Alta.	1/86	120	3		Lloydminster	S	30.0	800
Foam flood										
Signalta Resources	Pembina	Alta.	10/86	2,240	13	1	Ostracod	S	12.0	70

Table 2

Active U.S. EOR projects

	Number of projects									Change from 1986,
	1971	1974	1976	1978	1980	1982	1984	1986	1988	%
Thermal										
Steam	53	64	85	99	133	118	133	181	133	− 26.5
Combustion in situ	38	19	21	16	17	21	18	17	9	− 47.1
Hot water	—	—	—	—	—	—	—	3	10	+233.3
Total thermal	**91**	**83**	**106**	**115**	**150**	**139**	**151**	**201**	**152**	**− 24.4**
Chemical										
Micellar-polymer	5	7	13	22	14	20	21	20	9	− 55.0
Polymer	14	9	14	21	22	55	106	178	111	− 37.6
Caustic/alkaline	—	2	1	3	6	10	11	8	4	− 50.0
Total chemical	**19**	**18**	**28**	**46**	**42**	**85**	**138**	**206**	**124**	**− 39.8**
Gases										
Hydrocarbon miscible-immiscible	21	12	15	15	9	12	16	26	22	− 15.4
CO_2 miscible	1	6	9	14	17	28	40	38	49	+ 28.9
CO_2 immiscible	—	—	—	—	—	—	18	28	8	− 71.4
Nitrogen	—	—	—	—	—	—	7	9	9	0
Flue gas (miscible and immiscible)					8	10	3	3	2	− 33.3
Total gases	—	—	—	—	**34**	**50**	**84**	**104**	**90**	**− 13.5**
Other										
Carbonated waterflood								1	0	−100.0
Grand total					**226**	**274**	**373**	**512**	**366**	**− 28.5**

The $75 million first stage, which will involve 6 sq miles in the field, will require a 26-mile, 12-in. pipeline to the field from the existing Central Basin CO_2 pipeline.

Texas, of course, doesn't have a monopoly on CO_2 EOR projects. Exxon Co. U.S.A.'s 112-mile, 20-in. CO_2 line from Green River to Bairoil, Wyo., opened the door for Amoco to begin injection into the Wertz field Tensleep formation in 1986. The Lost Soldier field in that area is targeted for injection this year.

The future. In 1986, the Journal's EOR survey was virtually complete before the full import of the crude oil price plunge was known. It is therefore no wonder that of the 108 projects listed for completion during 1986 and 1987, few survived. Since the beginning of 1986 to early 1988, only 31 new projects were initiated.

Planned polymer projects took the biggest hit. Almost half of those delayed or canceled were polymer projects.

Of the 38 planned, only one has been started. Six still remain as future projects in the current survey. One additional polymer project not in the 1986 survey was started in 1987.

Planned immiscible CO_2 projects also took their lumps. Some 27 were cancelled by Texaco offshore Louisiana. The largest cancellation in this category in terms of acreage was Amoco's 16,340-acre Levelland, Tex., project. Of the 43 CO_2 projects listed as planned in 1986, only 9 have survived (5 were started up and four are included in the 15 still listed as planned).

Steam projects, however, bucked the trend. There are now 38 planned compared with 25 two years ago. Of the 38 now listed, 15 of them were also listed 2 years ago which raises a question about the viability of some of them. ▪

Table C

	Reservoir oil				Residual saturation %							
Depth, ft	Gravity, °API	cp	°F.	Previous prod.	Start	End	Project maturity	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
2,450	22.0	34	75	Prim./WF	60.0		JS	1,360		TETT		FW
4,600	28.0	3.00	150	Prim./WF	35.0		NC					P
4,900	42.0	1.14	133	WF	38.0	25.0	HF			Prom.		P (Exp. L)
4,900	42.0	1.14	133	WF	38.0	27.0	JS			Prom.		
3,000	24.0	24	84	Prim./WF	62.0		HF	340	100	Prom.	Yes	P (Exp. L)
3,200	23.0	13.40	94	WF	51.0	40.0	NC					
1,700	14.5	4,000	74	Prim.	77.0		JS	550	550	Succ.	Yes	P (Exp. UL)
2,900	18.0	70.30	110	Prim.	66.0		HF	3,585	3,585	Succ.	Yes	FW
2,900	18.0	70.00	110	Prim.	62.0		HF	1,460	1,460	Succ.	Yes	FW
1,800	12.2	15,000	70	Prim.	85.0	60-68	HF	650	325	Disc.		P
3,100	24.0	16.00	125	WF	62.0	40.0	HF	138	138	Prom.	No	P (Exp. UL)
2,900	18.0	70.00	110	Prim.	70.0		HF	1,400	1,400	Succ.	Yes	FW
3,550	28.0	6.00	100	WF	45.0	25.0	NC					
2,450	14.3	2,750	70	Prim.	100.0	80.0	HF	350	350	Prom.	Yes	P (Exp. UL)
2,100	12.0	8,000	75	Prim.	85.0		JS	80	60	Prom.	Yes	P (Exp. L)
5,659	42.0	0.35		Gas injection	78.0	31.0	HF	168	168	Prom.	Yes	FW

Producing Canadian EOR projects* — continued

Operator	Field	Province	Start date	Area, acres	– Number wells –		Pay zone	Form-ation type	Porosity, %	Permea-bility, md
					Prod.	Inj.				
Hydrocarbon miscible										
Amoco Canada	Ante Creek Unit 1	Alta.	1968	6,080	13	9	Beavarhill Lake	LS	6.0	9
Amoco Canada	Nipisi	Alta.	2/84	16,640	105	26	Gilwood	S	18.0	200
Amoco Canada	South Swan Hills	Alta.	1973	28,480	166	49	Beaverhill Lake	LS	8.0	49
Amoco Canada	Bigoray Nisku B	Alta.	2/80	251	3	1	Nisku D-2	LS	5.0	1,130
Amoco Canada	Rainbow S.	Alta.	8/72	490	5	2	Keg River	Dolo.	6.0	40
Canterra Energy	Rainbow KRD Pool	Alta.	3/76	85	1	1	Keg River	LS	10.0	200
Canterra Energy	Rainbow H Pool	Alta.	6/73	165	3	1	Keg River	LS	9.4	200
Canterra Energy	Rainbow Lake	Alta.	6/84	2,500	28	9	Keg River	LS	8.0	300
Canterra Energy	Rainbow E Pool	Alta.	6/72	173	5	1	Keg River	LS	12.0	300
Canterra Energy	Rainbow G Pool	Alta.	10/72	163	2	1	Keg River	LS	8.0	300
Canterra Energy	Rainbow O Pool	Alta.	2/70	703	9	1	Keg River	LS	6.0	150
Canterra Energy	Rainbow KRA Pool	Alta.	12/68	633	17	2	Keg River	LS	10.1	100
Canterra Energy	Rainbow EEE Pool	Alta.	4/70	150	2	1	Keg River	LS	16.8	500
Chevron Canada Resources	Mitsue, Stage 1 & 2	Alta.	5/85	17,280	71	27	Gilwood	S	13.4	282
Chevron Canada Resources	Pembina Nisku F	Alta.	12/87	200	3	1	Nisku F	LS	12.7	660
Chevron Canada Resources	Acheson D-3A	Alta.	7/87	610	15	1	Leduc D3	LS	12.0	5,000
Chevron Canada Resources	Bigoray Nisku F	Alta.	3/87	150	2	1	Nisku F	LS	10.0	250
Chevron Canada Resources	W. Pembina Nisku A	Alta.	8/81	200	2	1	Nisku A	LS	10.0	750
Chevron Canada Resources	W. Pembina Nisku D	Alta.	5/81	320	2	1	Nisku D	LS	10.0	300
Chevron Canada Resources	Pembina Nisku A	Alta.	2/84	400	3	1	Nisku A	LS	8.0	250
Chevron Canada Resources	W. Pembina Nisku C	Alta.	4/84	130	2	1	Nisku C	LS	11.0	1,100
Chevron Canada Resources	Pembina Nisku D	Alta.	11/85	400	5	1	Nisku	LS	12.0	750
Dome Petroleum	Kaybob South	Alta.	7/84	8,000	40	9	Triassic	Dolo.	11.5	92
Dome Petroleum	Willesden Green	Alta.	1977	26,000	110	46	Cardium	S	11.0	5
Gulf Canada	Fenn-Big Valley	Alta.	4/83	1,268	26	7	Nisku	Dolo.	8.0	400
Gulf Canada	Goose River	Alta.	10/86	2,847	14	5	Beaverhill Lake	LS	8.0	240
Home Oil	Swan Hills	Alta.	10/85	11,520	86	23	Beaverhill Lake	LS	8.5	54
Mobil Oil Canada	Rainbow	Alta.	7/83	110	4	1	Keg River	Dolo./LS	9.8	1,000-4,000
Mobil Oil Canada	Rainbow	Alta.	9/72	360	14	2	Keg River	Dolo./LS	8.6	7,000
Petro-Canada	Brazeau River	Alta.	9/81	640	3	1	Nisku	LS	7.0	50
Petro-Canada	Caroline	Alta.	9/84	12,620	27	12	Cardium	S	10.0	12
Petro-Canada	Brazeau River	Alta.	9/80	640	2	1	Nisku	LS	10.0	396
Petro-Canada	Brazeau River	Alta.	11/80	640	2	1	Nisku	LS	10.0	35
Shell Canada	Simonette	Alta.	11/86	150	4	1	Leduc D-3	Dolo.	7.0	10-50
Texaco Canada Resources	Wizard Lake	Alta.	1969	2,725	49	14	Leduc D-3A	Dolo.	9.6	1,375
Texaco Canada Resources	Pembina 'K' Pool	Alta.	1980	126	2	1	Nisku	Dolo.	12.7	2,020
Texaco Canada Resources	Pembina 'Q' Pool	Alta.	1985	301	2	1	Nisku	Dolo.	9.8	1,970
Texaco Canada Resources	Pembina 'M' Pool	Alta.	1983	192	2	1	Nisku	Dolo.	9.0	540
Texaco Canada Resources	Pembina 'L' Pool	Alta.	1985	625	4	2	Nisku	Dolo.	10.5	1,060
Texaco Canada Resources	Pembina 'O' Pool	Alta.	1983	346	1	1	Nisku	Dolo.	11.8	3,100
Texaco Canada Resources	Pembina 'G' Pool	Alta.	1981	328	3	1	Nisku	Dolo.	8.0	900
Texaco Canada Resources	Pembina 'P' Pool	Alta.	1983	420	3	1	Nisku	Dolo.	10.3	2,400
Natural gas immiscible										
Home Oil	Silverdale	Sask.	12/85	160	9	3	Sparky	S	29.0	2,000
Polymer										
Chevron Canada Resources	Taber Mannville D Unit 1	Alta.	6/87	480	7	2	Mannville D	S	22.3	1,140
Encor Energy	Rapdan Unit	Sask.	1/86	440	12	5	Upper Shaunavon	S	17.0	85
Steam										
Amoco Canada	Elk Point	Alta.	1987	33	9	4	Lower Cummings	S	30.0	1,500
Canada Northwest Energy	Atlee Buffalo	Alta.	9/86	640	10		Glauconite	S	30.0	2,000
Home Oil	Kitscoty	Alta.	1981	160	9	9	Sparky B	S	27.6	905
Husky	Westhazel	Sask.	1985	0	0	0	GP	US	33.0	5,000
Husky	Aberfeldy	Sask.	1979	63	24	5	Sparky	US	30.0	1,700
Koch Exploration Canada	Fort Kent	Alta.	12/85	160	13		Upper Grand Rapids	S	35.0	
Mobil Oil Canada	Celtic	Sask.	4/85	50	5		General Petro.	S	35.0	2,000
Mobil Oil Canada	Cold Lake	Alta.	1982		3		Lower Grand Rapids	S	35.0	1,000
Mobil Oil Canada	Celtic	Sask.	10/80	125	25		Waseca	S	35.0	1,000
Norcen	Provost	Alta.	1985	20	9	9	McLaren	S	27-30.0	4,000
Phillips Petroleum	Coleville	Sask.	1984	35	2	2	Bakken	S	25.0	400
Sceptre Resources	Tangleflags North	Sask.	12/87	17	1	3	Lloydminster Sand	US	32.5	
Texaco Canada Resources	Lone Rock	Sask.	11/84	45	13	3	Sparky	S	34.4	2,800
Westmin Resources	Lindbergh	Alta.	1985	40	8	1	Basal Mannville	S	30.0	3,000
Westmin Resources	Lindbergh	Alta.	1985	160	16		Basal Mannville	S	30.0	3,000

Producing EOR projects outside U.S. and Canada

Country	State/area	Operator	Project type	Field	Start date	Area, acres	—Number wells—		Pay zone	Form-ation type	Porosity, %	Permea-bility, md
							Prod.	Inj.				
Austria		OMV	Caustic	Matzen/Scho	7/80	33	5	1	Torton 9th	S	23.5	300
Austria		OMV	Steam	Maustrenk	7/80	123	19	3	Schlier		24.0	147
Colombia	Middle Magdalena Basin	Texas Petroleum	Steam	Teca	2/84	3,000	200		Oligocene A & B	S	28.0	1,200
Colombia	Middle Magdalena Basin	Texas Petroleum	Steam	Cocorna	3/87	15	8	3	Oligocene B	S	28.0	700
Congo		Elf Congo	Steam	Emeraude-Offshore	1985	9	8	2	Senonien	S	25.0	80

Depth, ft	Reservoir oil			Previous prod.	Residual saturation %		Project maturity	Total prod. b/d	Enhanced prod. b/d	Project eval.	Profit	Project scope
	Gravity, °API	cp	°F.		Start	End						
11,000	40.0	0.14	233	Prim.	90.0	60.0	HF	1,230	1,230	Succ.	Yes	FW
5,500	41.0	0.84	131	WF	30.0	5.0	JS	17,000	3,000	Succ.	Yes	FW
8,500	38.0	0.40	225	Prim./WF	35.0	13.0	NC	17,925	17,925	Succ.	Yes	FW
7,500	34.0	1.40	169	Prim.	0.7	0.3	HF	800	800	Succ.	Yes	FW
6,200	40.0	0.30	183	Prim.			NC	1,900	1,900	Succ.	Yes	FW
6,310	40.0	0.426	195	Prim.	90.0	27.0	NC	180	180	Succ.	Yes	FW
6,210	39.0	0.596	187	Prim.	92.0	28.0	HF	1,500	1,500	Succ.	Yes	FW
6,000	39.0	0.83	180	WF	52.0	23.0	JS	8,000	3,000	Prom.	Yes	FW
5,932	39.0	0.439	175	Prim.	91.0	27.0	HF	3,200	3,200	Succ.	Yes	FW
6,151	39.0	0.485	185	Prim.	92.0	28.0	HF	750	750	Succ.	Yes	FW
6,053	42.0	0.28	180	Prim.	87.0	26.0	NC	950	950	Succ.	Yes	FW
6,380	43.0	0.29	195	Prim.	90.0	30.0	HF	5,030	5,030	Succ.	Yes	FW
6,085	37.0	0.542	180	Prim.	95.0	29.0	NC	200	200	Succ.	Yes	FW
5,000	41.0	0.65	147	WF	30.0	19.0	JS	10,250	4,350	Succ.	Yes	FW
8,000	40.0	0.50	208	WF	75.0	43.3	JS	285	0	TETT	TETT	P (Exp. L)
5,000	39.0	0.85	139	Prim.	90.0	29.0	JS	2,400	1,400	TETT		FW
10,500	37.0	0.80	175	WF	90.0	5.0	JS	4,000	1,100	Succ.	Yes	FW
10,000	42.0	0.30	228	Prim.	90.0	5.0	HF	3,700	2,000	Succ.	Yes	FW
10,000	42.0	0.20	218	Prim.	90.0	5.0	HF	3,000	1,500	Succ.	Yes	FW
10,000	41.0	0.30	210	WF	80.0	5.0	JS	3,650	900	Succ.	Yes	FW
10,300	42.0	0.30	218	WF	75.0	9.0	HF	6,000	2,500	Prom.	Yes	FW
9,000	41.0	0.70	176	WF	90.0	5.0	JS	6,400	1,700	Succ.	Yes	FW
6,981	40.0	0.419	190	WF	46.0	31.0	HF	4,500	950	Prom.	Yes	FW
6,400	38.0	0.55	136	Prim.	87.0	73.0	NC	2,000	700	Disc.	No	FW
5,249	32.8	1.34	136	Prim.	33.0		JS	623	623	Succ.	Yes	FW
9,200	41.0	0.4	234	WF			JS	3,800	0	TETT		FW
8,700	39.0	0.4		WF	30.0	5.0	JS	13,000	3,800	Succ.	Yes	FW
5,500	39.0	0.46	190	WF	0.4	0.1	HF	283	283	Prom.	Yes	FW
5,500	39.0	0.47	184	Gas/WF	0.8	0.1	HF	2,500	2,500	Succ.	Yes	FW
10,091	42.0	0.38	216	Prim.	90.0	15.0	HF	3,100	3,100	Succ.	Yes	FW
8,200	46.0	0.25	173	Prim.	85.0	45.0	HF	1,900	1,550	Succ.	Yes	FW
10,215	44.0	0.40	218	Prim.	90.0	10.0	HF	7,400	7,400	Succ.	Yes	FW
10,544	46.0	0.20	222	Prim.	90.0	15.0	HF	2,500	2,500	Succ.	Yes	FW
11,600	47.0	0.13		WF			JS	170	0	TETT		
6,500	38.0	0.88	167	Prim.	93.0	3.8	HF	28,000	28,000	Succ.	Yes	FW
9,469	43.6	0.37	198	Prim	82.0	5.0	JS	2,010	860	Prom.	Yes	FW
9,421	41.3	0.42	196	Prim.	91.0	5.0	JS	2,700	1,410	Prom.	Yes	FW
9,336	41.1	0.14	198	Prim.	93.0	5.0	JS	2,460	1,150	Prom.	Yes	FW
9,415	40.9	0.42	199	WF	88.0	5.0	JS	3,770	1,470	Prom.	Yes	FW
9,332	43.4	0.32	190	Prim	84.0	5.0	JS	1,250	540	Prom.	Yes	FW
9,541	43.2	0.33	204	Prim.	80.0	5.0	JS	2,500	1,100	Prom.	Yes	FW
9,531	45.4	0.36	200	Prim.	87.0	5.0	JS	4,110	1,920	Prom.	Yes	FW
560	16.0	5,000		Prim.	82.0	74.6	HF	75	75	Prom.	Yes	P (Exp. UL)
3,200	18.0	55	121	WF	92.0	7.0	JS	17,600	16,400	Succ.	Yes	FW
4,500	23.0	10	132	WF	55.0	43.0	JS	470	350	Prom.	Yes	P (Exp. L)
2,000	12.0	30,000	73	Prim.			JS	400		TETT		P
2,900	14.5	800	80	Prim.	80.0	1.0	JS	1,000	1,000	Succ.	Yes	P (Exp. L)
2,066	13.0	3,000		Prim.	80.0	52.0	HF	725	575	Succ.	Yes	P (Exp. L)
1,575	13.6	18,000	70	Prim.	82.0		JS			TETT	TETT	P (Exp. UL)
1,700	17.0	800	70	Prim./WF	71.0	43.0	HF	1,000	1,000	Prom.	No	P (Exp. UL)
1,000	11.0	21,300		None	12.0		HF	0	0	Prom.		P
1,576	13.0	7,000	67	Prim.	69.0	46.0	JS	290	290	Prom.	Yes	P (Exp. L)
1,200	10-12.0	20000-100000	60	None	65.0	50.0	NC	100	100	Prom.		
1,500	13.0	5,380	61	Prim.	70.0	47.0	HF	630	630	Prom.	Yes	P (Exp. L)
2,430	12.0	2,000	80	Prim.	82.0	45.0	HF	600	600	Prom.	No	P (Exp. L)
2,600	14.0	1,000		WF			NC	60	22	Prom.	No	P
1,476	12-13.0	13,000	66	Prim.	80.0	15.0	JS			TETT		P
1,900	16.0	800	70	Prim.	82.0		HF			Prom.	TETT	P (Exp. L)
1,900	12.0	1,200		Prim.	70.0	55.0	JS	500		TETT	TETT	P (Exp. UL)
1,900	12.0	1,200		Prim.	70.0	55.0	JS	500	400	TETT	Yes	P (Exp. UL)

Table D

Depth, ft	Reservoir oil			Previous prod.	Residual saturation %		Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
	Gravity, °API	cp	°F.		Start	End						
4,330	21.0	12.7		Prim./WF	62.0	43.0	NC	78	21	Succ.	Yes	P (Exp. L)
3,018	26.0	7.81		Prim./WF	51.0	46.0	NC	84	5 4	TETT	No	FW
1,600	12.8	2,965		Prim.	60.0		HF	17,000	8,500	Succ.	Yes	FW
2,100	12.8	2,965		Steam soak	57.0	19.0	JS	300	50	Prom.		P (Exp. L)
600	22.0	100	85	Prim.			HF	1,600	1,600	Prom.		P

Producing EOR projects outside U.S. and Canada — continued

Country	State/area	Operator	Project type	Field	Start date	Area, acres	—Number wells—		Pay zone	Formation type	Porosity, %	Permeability, md
							Prod.	Inj.				
England		BP	Micellar-polymer	Bothamsall	7/83	10	3	1	Sub-Alton	S	12.0	14
France		Elf Aquitaine	Micellar-polymer	Chateaurenard	1984	71	9	4	Neocomian	S	30.0	1,300
France		Elf Aquitaine	Polymer	Chateaurenard	1985	12	4	1	Neocomian	S	30.0	1,000
France		Elf Aquitaine	Steam	Lacq Superieur	1977	30	8	1	Senonian	LS	15.0	1
Hungary		NKFV	CO_2	Nagylengyel	9/80	200	5	1	Triassic	LS		1,000
Hungary		NKFV	CO_2	Budafa	1981	1,013	77	60	Zala Kerettye	S	22.0	110
Hungary		NKFV	Combustion	Demjen East	1986	13.6	6	3	Oligocene c,da,df,e	S	19.0	100
Indonesia		Total	Micellar-polymer	Handil	1982	4	1	3		S	30.0	1,000
Trinidad		Trintoc	CO_2 push-pull	Forest Reserve	5/84		17		Forest Sands	S	30.0	150-300
Trinidad		Trintoc	Steam	Forest Reserve	8/76	58	4	1	Forest Sand	S	31.0	205
Trinidad		Trintoc	Steam	Point Fortin Central	2/86	32	15		Cruse E	S	31.0	95
Trinidad	Point Fortin	Trintoc	Steam	Parrylands	7/82	90	46		Forest Sands	S	30.0	500
Trinidad		Trintoc	Steam	Forest Reserve	7/65	135	50	14	Forest Zone 5.1	S	33.0	340
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	5/64	1,686	12	2	L-1L	S	30.4	2,642
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	8/61	5,467	31	3	I.2L,3	S	37.0	2,500
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	1/67	1,325	9	1	L-1L	S	31.0	2,940
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	1/64	2,422	18	2	J-3	S	28.0	3,000
Venezuela	Monagas	Corpoven S.A.	Gas	Oritupano	2/79	1,052	8	1	A-9	S	28.0	1,300
Venezuela	Monagas	Corpoven S.A.	Gas	Oritupano	9/76	1,054	6	1	A-7	S	30.0	300
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			7	7	U-1 (OS-721)	S	27.9	2,000
Venezuela	Anzoategui	Corpoven S.A.	Steam	Mezones	4/83	57,314	14	14	U-1,2,3	S	34.0	1,200
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			13	13	U-23 (MFB-53)	S	31.9	1,400
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			4	4	S-3,4 (MBA-8)	S	30.7	5,800
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			58	58	U-3,4 (MFB-24)	S	28.6	5,000
Venezuela	Anzoategui	Corpoven S.A.	Steam	Arecuna	12/83	500	15	15	T	S	30.0	2,500
Venezuela	Campo Cerro Negro	Lagoven S.A.	Steam	B.E.P.-Cerro Negro	1984	49,090	144		Ofic. Morichal-Memb.	S	32.0	7,000
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo Picv	3/81	90	22	6	Morichal-1	S	32.0	10,000
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo	12/69	4,329	18		Ofic. Jobo Member	S	32.0	2,500
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo - P.E.T.C.	8/85	267	17		Oficina	S	30.0	8,000
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo	12/69	27,522	99		Ofic. Mor-Member	S	31.0	5,000
Venezuela	Campo Pilon	Lagoven S.A.	Steam	West Pilon	12/69	1,065	29		Oficina-1	S	29.1	5,000
Venezuela	Zulia	Lagoven S.A.	Steam	Bachaquero	12/80	343	2		Bachaquero Superior	S	23.0	1,500
Venezuela	Zulia	Lagoven S.A.	Steam	Lagunillas	2/71	9,343			Bachaquero	S	34.0	4,000
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	3/69	1,773	145		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	4/65	420	59		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	4/59	339	33		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	8/69	415	24		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	11/79	3,101	267		L.L.	S	33.7	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	9/64	415	36		L.L.	S	38.1	3,000
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	10/63	873	82		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	8/68	2,629	224		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	8/69	1,642	131		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	4/70	2,565	220		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	7/67	1,271	114		L.L.	S	38.1	675
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	7/67	1,500	134		L.L.	S	38.1	750
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	6/68	141	15	7	L.L.	S	33.0	
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	10/67	2,221	197		L.L.	S	38.1	750
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	1/70	3,025	147		L.L.	S	33.7	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	1/74	1,830	135	21	L.L.	S	38.1	780
Venezuela	Zulia	Maraven S.A.	Steam	Bachaquero	10/84	7,795	539		Post-Eocano	S	37.3	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	2/61	36	7		L.L.	S	38.0	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	7/67	618	54		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	6/66	141	15		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	11/80	3,565	299		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	8/70	2,114	175		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	5/68	2.667	232		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	12/68	1,956	168		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	1/70	76	7		L.L.	S	33.7	
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 15	1/67	115	15	2	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 14	10/67	64	8	1	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 17	10/74	81.5	10	2	Valenginian	S	30.0	6,000
West Germany		Wintershall AG	Hot water flood	Ruehlertwist	12/86	53	10	2	Valenginian	S	30.0	400
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 10	11/81	41.5	6	1	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 11	9/73	70	8	1	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 07	10/67	81.5	10	1	Valenginian	S	30.0	6,000
West Germany		Texaco AG	Polymer	Hankensbuettel Westblock 4	4/77	165	7	2	Upper Dogger-Beta	S	28.0	2,000-4,000
West Germany		Texaco AG	Polymer	Hankensbuettel Westblock 2	5/79		6	3	Upper Dogger-Beta	S	28.0	2,000-4,000
West Germany	Northw[illegible]	Preussag AG	Polymer	Edesse-Nord	11/85	4.2	3	2	Wealden	S	24.0	1,200
West Germany	Lower Saxony	Wintershall AG	Polymer	Bockstedt	9/84	57	5	1	Valenginian	S	23.0	4,000
West Germany		Texaco AG	Polymer	Oerrel Westblock 4	1980	410	13	3	Upper Dogger-Beta	S	28.0	2,000-4,000
West Germany	Emsland	BEB	Steam	Ruhlermoor	8/86	300	30	4	Valanginian	S	27-31.0	600-1000
West Germany	Lower Saxony	BEB	Steam	Georgsdorf	1/75	165	19	2	Valanginian	S	25.0	460-1150
West Germany	Lower Saxony	BEB	Steam	Georgsdorf	12/79	144	23	3	Valanginian	S	25.0	1000-1300
West Germany	Lower Saxony	BEB	Steam	Ruhlermoor	11/80	230	24	4	Valanginian	S	28-30.0	300-1000
West Germany	Lower Saxony	Wintershall AG	Steam	Ruehlertwist	12/78	237	24	2	Valenginian	S	28.0	5,000
West Germany	Lower Saxony	Wintershall AG	Steam	Emlichheim 06	5/81	121	25	4	Valenginian	S	30.0	6,000
West Germany		Texaco AG	Surfactant	Hankensbuettel Westblock 4	1982	83	7	3	Lower Dogger-Beta	S	28.0	300-1,000

	Reservoir oil				Residual saturation %							
Depth, ft	Gravity, °API	cp	°F.	Previous prod.	Start	End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
3,140	41.0	3	110	WF	57.0	50.0	NC	12		Disc.	No	
1,950	27.0	40	86	Prim.	48.0	23.0	NC	118	32	Succ.	No	P (Exp. UL)
1,950	27.0	40		Prim.	55.0	30.0	HF	144	108	Succ.	Yes	P (Exp. UL)
1,950-2,100	22.0	20	150	Prim.	45.0		HF	1,000	400	Succ.	Yes	FW
7,400	26.0	92	248	Prim.			NC	200	200	Succ.		
3,000	42.0	0.8	147	Prim.			NC	700	700	Succ.		
820	39.0	7		Prim.			JS	92	83	TETT	No	P (Exp. L)
4,500	33.0	0.4	115	WF	35.0			400	400			
	20-25.0	66-90		Prim.	60.0		JS	150	150	Prom.		P (Exp. L)
3,000	19.0	32	120	Prim.	57.0	45.0	HF	100	100	Prom.		
1,200-1,600	16-18.0	150		Prim.	58.0	18.0	JS	300	300	Prom.		P (Exp. L)
1,000-1,200	11.5	5,000			75.0	20.0	JS	650	650	Prom.		FW
1,000-1,300	15.7	148		Prim.	70.0	20.0	HF	1,650	1,650	Succ.	Yes	FW
3,350	18.0	12.5	152	WF	90.0	65.0	NC	2,600	2,600	Succ.	Yes	FW
3,150	15.0	38	150	Prim.	90.0	67.0	HF	500	400	Prom.	Yes	FW
3,430	21.0	5.5	154		90.0	63.0	NC	2,200	2,200	Succ.	Yes	FW
3,300	20.0	52	149		90.0	50.0	HF	3,000	3,000	Succ.	Yes	FW
5,200	21.0	4.9	146	Prim.	84.0	69.0	HF	1,200	1,200	Prom.	Yes	FW
5,150	20.5	4.9	146	Prim.	90.0	72.0	HF			Succ.	Yes	FW
3,400	9.8	232		Prim.	78.8		HF	1,358	980	Prom.	Yes	P (Exp. L)
4,300	11.5	800	130	Prim.	70.0	63.0	HF	4,900	2,300	Prom.	Yes	P (Exp. UL)
2,650	9.3	376		Prim.	88.0		HF	11,047	6,700	Prom.	Yes	P (Exp. L)
2,850	10.0	370		Prim.			JS	600	450	TETT	Yes	P (Exp. L)
	9.2	351		Prim.	83.0		HF	46,400	28,000	Succ.	Yes	P
3,150	10.0	1,617	140	Prim.	80.0	72.0	HF	1,390	800	Prom.	Yes	FW
2,800	8.5	5,500		Prim.	80.0		JS	33,120	8,050	Succ.	Yes	
3,600	8.5	1,800		Prim.	82.0		NC	4,000	4,000	Succ.	Yes	P (Exp. UL)
	12.6	80		Prim.	80.0		JS	2,500	180	Succ.	Yes	FW
4,025	8.5	1,850		Prim.	75.0		JS	3,500	3,500	Succ.	Yes	P (Exp. L)
3,600	8.5	1,850		Prim.	85.0		JS	27,100	1,430	Succ.	Yes	FW
3,200	9.5	1,850		Prim.	82.2		JS	4,350	450	Succ.	Yes	FW
3,400	14.0	185		Prim.	85.0		JS	10		TETT	No	P (Exp. L)
2,690	12.0	600		Prim.	84.0		HF	12,429	6,428	Succ.	Yes	FW
1,700	11.9	2,000	111	Prim.	92.7	74.5	HF	1,100	850	Prom.	Yes	
2,100	11.4	3,500	117	Prim.	96.9	58.7	NC	3,900	1,370	Succ.	Yes	
1,500	12.2	1,000	108	Prim.	92.6	72.3	HF	1,800	550	Prom.	Yes	
850	10.5	10,000	95	Prim.	99.9	84.6	HF	1,600	1,600	Prom.	Yes	
2,615	15.0	580	126	Prim.	83.3	68.8	HF	12,980	6,000	Prom.	Yes	
1,250	12.0	3,000	104	Prim.	95.6	78.6	HF	1,400	950	Prom.	Yes	
1,750	13.1	750	113		86.0	74.0	NC	1,900	592	Prom.	Yes	
1,000	11.6	4,000	104	Prim.	94.6	79.6	HF	6,300	5,000	Prom.	Yes	
1,250	10.2	12,000	102	Prim.	99.9	89.9	HF	5,800	5,800	Prom.	Yes	
1,750	11.8	2500-11500	115		97.3	89.4	HF	20,000	10,680	Prom.	Yes	
1,220	13.1	6,000	123	Prim.	94.3	80.8	HF	3,500	2,200	Prom.	Yes	
1,400	11.3	1,000	110	Prim.	91.1	76.0	HF	5,400	3,300	Prom.	Yes	
1,250	13.1	1,000	113	Prim.	88.0	68.0		3,100	2,000	Prom.	Yes	
1,746	13.1	4,100	110	Prim.	95.1	80.9	HF	12,600	10,000	Prom.	Yes	
2,500	15.2	500-4500	122	Prim.	86.0	74.3	HF	6,190	2,460	Prom.	Yes	
1,590	12.0	1,000	111		81.0	56.0	HF	20,000	18,000	Succ.	Yes	
2,000	13.0	300-800	117	Prim.	85.0		JS	93,000	41,600	Prom.	Yes	
1,000	9.5	12,000	105	Prim.	100.0	76.9	NC	130	130	Prom.	Yes	
2,100	11.4	3,500	117	Prim.	9.0	7.0	NC	4,100	760	Succ.	Yes	
1 250	13.1	1,300	104	Prim.	92.0	78.0	NC	300	60	Prom.	Yes	
2,398	11.0	2000-3700	125	Prim.	90.6	77.9	HF	38,000	12,870	Prom.	Yes	
1,725	11.4	4000-9000	118	Prim.	97.8		HF	10,600	5,200	Prom.	Yes	
1,200	12.0	500	104		93.6	82.5	HF	5,400	5,100	Prom.	Yes	
1,250	11.7	7,500	106	Prim.	97.5	82.5	HF	7,500	6,200	Prom.	Yes	
2,600	15.2	250	125	Prim.	73.7	63.5	NC	270	220	Succ.	Yes	
2,300	24.5	175	95	WF	72.0	54.0	NC	155	155	Succ.	Yes	
2,550	24.5	175	95	WF	73.0	58.0	NC	135	135	Succ.	Yes	
2,300	24.5	175	95	WF	66.0	55.0	HF	180	150	Succ.	Yes	
2,460	25.0	175		WF	76.0	68.0	JS	65	47	TETT	TETT	P (Exp. L)
2,460	24.5	175	95	WF	70.0	68.0	NC	40	30	Disc.	No	
2,550	24.5	175	95	WF	72.0	68.0	NC	250	230	Succ.	Yes	
2,400	24.5	175	95	WF	70.0	56.0	HF	90	90	Succ.	Yes	
4,900	27.0	13	136	WF	69.0	43.0	NC	1,000	700	Succ.	Yes	
4,900	28.0	13	136	WF	72.0	42.0	NC	1,700	1,300	Succ.	Yes	
1,200	36.0	8	73	WF	53.0	37.0	NC	20	12	Succ.	No	P (Exp. L)
4,100	34.0	11	130	WF	39.0	33.0	JS	150	40	Prom.	TETT	
4,900	25.0	17	136	WF	60.0	45.0	HF	540	400	Prom.	Yes	
1,700-2,100	25.0	120		Prim.	78.0		JS	2,100	1,500	TETT	TETT	FW
2,130-2,790	27.0	120	95	Prim.			HF	1,160	1,000	Succ.	Yes	
2,130-2,790	27.0	120	95	Prim.			HF	1,260	900	Succ.	Yes	
2,070-2,460	25.0	120	96	Prim.			HF	1,400	1,100	Succ.	Yes	
2,650	25.0	175	100	Edge water drive	51.0	42.0	HF	1,370	1,300	Succ.	Yes	
2,400	24.5	175	95	Hot water flood	62.0	45.0	NC	1,670	1,660	Succ.	Yes	
4,900	27.0	11	136	WF	58.0	40.0	HF	100	30	TETT	TETT	

Producing thermal EOR in U.S.

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Form-ation type	Porosity, %	Permea-bility, md
Steam											
ARCO	Midway-Sunset	Calif.	Kern	12/84	1.5	3	1	Fairfield Tar Sand	S	32.0	3,030
ARCO	Midway-Sunset	Calif.	Kern	1/72	7.8	22	2	Potter	S	32.0	1,675
ARCO	Midway-Sunset	Calif.	Kern	2/72	3.1	49	5	Potter	S	32.0	2,500
ARCO	Midway-Sunset	Calif.	Kern	8/72	3.2	11	1	Reef Ridge	S	32.0	1,000
Amoco	Winkleman Dome	Wyo.	Fremont	1964	160	21	15	Nugget	S	22.8	481
Angus Petroleum	Kern River	Calif.	Kern	9/83	85	35	35	Kern River	S	31.0	2,000
Celeron Oil & Gas	South Belridge	Calif.	Kern		90	41	30	Tulare	S	38.0	4,000
Celeron Oil & Gas	Midway-Sunset	Calif.	Kern		15	10	10	Monarch Sand	S	30.0	2,500
Chevron	Cymric	Calif.	Kern	5/66	26	18	0	Tar	S	32.0	1,200
Chevron	Cymric 36W	Calif.	Kern	5/75	110	98	47	Tulare/Amnicola	S	33.0	1,800
Chevron	Cymric 62Z	Calif.	Kern	2/86	30	31	19	Tulare	S	33.0	2,900
Chevron	Cymric Sec. 31X	Calif.	Kern	4/79	69	38	17	Amnicola	S	35.0	2,700
Chevron	Edison 27-RT	Calif.	Kern	7/77	30	65	29	Kern River	S	30.0	
Chevron	Fruitvale	Calif.	Kern	5/77	860	142		Chanac	S	29.0	920
Chevron	Kern Bluff	Calif.	Kern	7/66	214	25		Santa Margarita	S	29.0	2,000
Chevron	Kern River KCL 39	Calif.	Kern	10/75	118	67	42	Kern River	S	33.0	
Chevron	Kern River MC1	Calif.	Kern	4/76	132	120	76	Kern River	S	34.0	2,800
Chevron	Kern River MCII	Calif.	Kern	4/71	80	129	30	Kern River	S	34.0	2,800
Chevron	Kern River Sec. 3	Calif.	Kern	9/68	424	345	155	Kern River	S	34.0	3,389
Chevron	Kern River Sec. 4	Calif.	Kern	6/78	156	200	64	Kern River	S	34.0	
Chevron	Kern River-ANO	Calif.	Kern	5/74	160	177	82	Kern River	S	32.0	
Chevron	Lost Hills Sec 18	Calif.	Kern	8/85	14	8	0	Tulare	S	38.0	2,000
Chevron	Lost Hills Sec. 18	Calif.	Kern	7/83	38	39	11	Tulare	S	38.0	2,100
Cnevron	Lost Hills Sec. 30	Calif.	Kern	1/80	190	37	0	Etchegoin A	S	40.0	800
Chevron	Lost Hills Sec. 32	Calif.	Kern	3/85	16	11	4	Etchegoin A	S	40.0	2,500
Chevron	Lost Hills Sec. 32	Calif.	Kern	2/79	150	29		Etchegoin A	S	36.0	
Chevron	McKittrick 6Z	Calif.		4/85	30	29	18	Tulare/Amnicola	S	36.0	2,900
Chevron	McKittrick 9Z	Calif.	Kern	8/78	80	27	11	Amnicola	S	38.0	2,700
Chevron	Midway-Sunset Sec. 15A	Calif.	Kern	5/78	23	36	5	Potter	S	36.0	3,900
Chevron	Midway-Sunset Sec. 25A	Calif.	Kern	6/87	35	3	2	Tulare	S	35.0	1,000
Chevron	Midway-Sunset Sec. 26C	Calif.	Kern	11/75	84	243	81	Monarch	S	32.0	1,100
Chevron	Midway-Sunset Sec. 2F	Calif.	Kern	10/83		44	10				
Chevron	Midway-Sunset. Sec. IF	Calif.	Kern	2/78	19	23	8	Upper 10-10	S	32.0	2,200
Chevron	N. E. McKittrick 16-Z	Calif.	Kern	9/75	87	42	27	Amnicola	S	35.0	2,700
Chevron	Tejon-Grapevine	Calif.	Kern	12/78	40	8		Basal Chanac		30.0	2,160
Chevron	West Coalinga 13-D	Calif.	Fresno	5/73	550	163	93	Temblor	S	35.0	1,000
Chevron	West Coalinga 25-D	Calif.	Kern	5/80	36	131	95	Chanac	S	29.0	1,000
Chevron	Yorba Linda	Calif.	Kern	7/62	80	76	0	Shallow Tar	S	27.0	1,000
Chevron	Kingdom Abo	Tex.	Terry	5/85	2,240	59	48	Abo Reef	Dolo.	4.5	8
DCR Petroleum	Camp Hill	Tex.	Anderson	7/86	7.25	11	4	Carrizo	S	37.0	2,500
Exxon	Edison	Calif.	Kern	1965	1,100			Kern River	S	28.0	1,100
Lawrence-Allison	Teapot Dome NPR-3	Wyo.	Natrona	10/85	20	22	4	Shannon	S	18.0	63
M. H. Whitter	Midway-Sunset	Calif.	Kern	1965	200	340		Potter	US	35.0	2,500
Marathon Oil	Garland	Wyo.	Big Horn	5/86	35	6	1	Madison	LS	15.5	10.4
Mobil	Cymric McKittrick Fee	Calif.	Kern	7/65	180	40	0	Welport Amnicola	S	35.0	3,000
Mobil	Edison	Calif.	Kern	12/81	100	11	0	Kern River	S	30.0	1,000
Mobil	Kern Front	Calif.	Kern	5/74	480	43	0	Etchegoin	S	37.0	1,000
Mobil	Midway-Sunset	Calif.	Kern	10/70	400	104	0	Monarch	S	34.0	4,000
Mobil	North Midway-Sunset	Calif.	Kern	11/67	410	300		Potter	S	35.0	1,000
Mobil	San Ardo	Calif.	Monterey	6/68	230	80	15	Aurignac	S	34.5	3,000
Mobil	San Ardo	Calif.	Monterey	3/80	63	31	9	Lombardi	S	32.5	3,000
Mobil	South Belridge	Calif.	Kern	1965	1,600	42		Tulare	S	35.0	3,000
Mobil	South Belridge	Calif.	Kern	1969	900	370	135	Tulare	S	35.0	3,000
Mobil	Saratoga	Tex.	Hardin	6/87	54	10	5	Miocene	S	35.0	3000
Oxy USA	Kern Front	Calif.	Kern	11/81	342	120	8	Etchegoin Chanac	S	33.0	3,250
Phillips	Smackover	Ark.	Ouachita	10/71	985	91	5	Nacatoch	S	35.0	2,000
Santa Fe Energy	Coalinga	Calif.	Fresno	3/79	280	250	60	Lower Temblor	S	30.0	100-3,000
Santa Fe Energy	Kern River	Calif.	Kern	1/80	180	143	68	Kern River	S	30.0	100-3,000
Santa Fe Energy	Midway	Calif.	Kern	1964	1,000	1,000		Potter Cyc.	S	30.0	2,500
Santa Fe Energy	Midway	Calif.	Kern	1970	400	450		Spellacy	S	30.0	2,250
Santa Fe Energy	Midway	Calif.	Kern	6/82	800	200		Tulare	S	33.0	1,300
Santa Fe Energy	Midway	Calif.	Kern	1/85	100	160	25	Potter S.D.	S	30.0	2,500
Shell	Arroyo Grande	Calif.		1/87	45	16	25	M6	S	31.0	
Shell	Belridge	Calif.	Kern	1961	2,880	4,350	984	Tulare	S	36.0	2,400
Shell	Brea Olinda	Calif.	Orange	6/85	19	20	2	Middle A Sand	S	20.0	200
Shell	Cat Canyon	Calif.	Santa Barbara	3/85	1,000	50	0	Basal Sisquoc	S	32.0	750
Shell	Coalinga	Calif.	Fresno	1981	300	150	12	Temblor Zone II	S	30.0	
Shell	Coalinga	Calif.	Kern	1980	300	199	39	Temblor Zone I	S		30
Shell	Coalinga	Calif.	Fresno	1984	300	60	1	Temblor Zone II	S	27.0	
Shell	Coalinga	Calif.		11/87	223	57	17	Etchegoin	S	34.0	
Shell	Cymric	Calif.	Kern	10/85	185	27	24	Tulare	S	36.0	
Shell	Kern River	Calif.	Kern	1970	600	550	220	Kern River Series	S	30.0	
Shell	McKittrick	Calif.	Kern	11/85	226	40	26	Tulare	S	36.0	
Shell	Midway-Sunset	Calif.	Kern	1971	375	637	50	Potter	S	30.0	
Shell	Midway-Sunset	Calif.	Kern	1980	85	146	13	Monarch	S	25.0	
Shell	Midway-Sunset	Calif.		1981	95	60	0	Upper Spellacy	S	28.0	
Shell	Midway-Sunset	Calif.	Kern	1983	143	182	24	Sub-Hoyt	S	31.0	
Shell	Midway-Sunset	Calif.	Kern	6/86	110			San Joaquin	S	33.0	
Shell	Mount Poso	Calif.	Kern	1971	2,800	253	46	Vedder	S	33.0	
Shell	Poso Creek	Calif.	Kern	6/80	360	70	0	Etchegoin	S	33.0	
Shell	Yorba Linda	Calif.	Orange	1971	310	300	44	Upper Conglomerate	S	22.0	6,000
Shell	White Castle	La.	Iberville	8/76	64	42	13	V type	S	35.0	3,000
Shell	White Castle	La.	Iberville	8/76	31	42	13	U	S	35.0	3,000
Shell Western E&P	Cymric	Calif.	Kern	12/86	185	27	24	Tulare	S	36.0	2000
Shell Western E&P	McKittrick	Calif.	Kern	6/87	226	40	26	Tulare	S	36.0	2000
Sun	Cymric	Calif.	Kern	1981	135	57	0	Tulare	S	35.0	1,500
Sun	Midway-Sunset	Calif.	Kern	3/64	106	205	14	Potter/Tulare	S	35.0	3,000
Sun	Midway-Sunset	Calif.	Kern	8/65	40	249		Potter	S	35.0	3,000
Sun	Midway-Sunset	Calif.	Kern	1/84		95	6	Potter/Marvic/Tulare	S		
Sun	Midway-Sunset	Calif.	Kern	7/84		174	0	Potter	S		
Sun	Midway-Sunset Sec. 15	Calif.	Kern	5/64	80	106	0	Potter	S	35.0	3,000

Table E

	Reservoir oil				Residual saturation %							
Depth, ft	Gravity, °API	cp	°F.	Previous prod.	Start	End	Project maturity†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
1,050	14.0	1,500	95	Prim.			HF	20	15	Succ.	Yes	P (Exp. L)
1,200	12.0	2,000	100	Steam soak			HF	475	315	Succ.	Yes	P (Exp. [illegible]
1,400	14.0	1,500	100	WF			NC	610	275	Succ.	Yes	FW
1,000	13.0	1,500	100	Steam soak			HF	110	83	Succ.	Yes	P ([illegible])
1,225	14.0	1,000	81	Prim.	71.0		NC	400	400	Succ.		FW
1,200	12.0	5,000		Prim.	55.0		JS	300	300	Succ.	Yes	FW
1,250	13.0	450			63.0	49.0		2,000	2,000	Succ.	Yes	FW
1,500	12.0	11,000	95					600	600	Succ.	Yes	FW
700	11.0	6,500	81	Prim.	99.0		NC	332	273	Succ.	Yes	FW
1,200	13.0	4,000	100		52.0		NC	4,261	4,261	Succ.	Yes	FW
1,200	12.0	5,500	100	Cyclic	51.0	15.0	JS	1,850	1,650	Succ.	Yes	FW
1,300	12.0	3,000	100	Prim.	50.0		NC	1,033	1,033	Succ.	Yes	FW
1,000	14.0	2,000	90	Prim.	50.0		NC	1,868	1,868	Succ.	Yes	FW
3,300	19.0	78.0	131	Prim.	71.0		HF	1,168	920	Succ.	Yes	FW
950	15.0	1,000	84	Prim.	74.0		NC	58	58	Succ.	Yes	
1,400	14.0	2,000	90		65.0		HF	1,043	1,043	Succ.	Yes	FW
960	14.0	2,000	90		59.0		HF	3,235	3,155	Succ.	Yes	FW
960	14.0	2,000	90	Prim.	59.0		HF	2,121	2,121	Succ.	Yes	FW
775	14.0	2,000	90	Prim.	55.0		HF	9,718	9,475	Succ.	Yes	FW
850	14.0	2,000	90		60.0		HF	4,251	3,980	Succ.	Yes	FW
1,000	14.0	2,000	90	Prim.	55.0		HF	5,107	5,107	Succ.	Yes	FW
350	12.0	4,600	90	Cyclic	55.0	20.0	JS	19	9	Disc.	No	P (Exp. UL)
300	14.0	400	75	Cyclic	86.0		JS	708	708	Succ.	Yes	P (Exp. L)
550	18.0	300	90	Prim.			HF	534	478	Prom.		
850	14.0	1,400	100	Cyclic	50.0	20.0	JS	170	125	Succ.	Yes	FW
900-1,150	18.0	200	90	Prim.	72.0		HF	516	75	Succ.	Yes	
1,300	13.0	2,700	100	Cyclic	48.0	15.0		1,912		Prom.		
1,300	13.0	4,000	100	Cyclic	47.0		HF	580	580	Succ.	Yes	FW
1,400	14.0	900	120	Cyclic	61.0	20.0	NC	1,416	965	Succ.	Yes	P
1,000	11.0	10,000	90	Cyclic	53.0		JS	75	0	TETT		P
1,300	14.0	1,500	150	Cyclic	58.0	20.0	HF	8,195	7,638	Succ.	Yes	FW
								2,797				
1,600	14.0	1,500	105	Cyclic	55.0	15.0	NC	498	418	Succ.	Yes	FW
1,300	12.0	4,000	100	Cyclic	57.0		HF	634	634	Succ.	Yes	FW
2,600	16.0	167	115	Prim.				41		Disc.	No	
1,200	13.0	1,000	90	Prim.	46.0	15.0	NC	2,741	2,550	Succ.	Yes	FW
2,500	12.0	2,300	100	Prim.	50.0	12.0	HF	5,911	5,500	Succ.	Yes	FW
250-1,650	13.0	6,400	97	Prim.	95.0		NC	829	656	Succ.	Yes	FW
7,500	28.5	3.40	120	WF	58.0	40.0	JS	3,180	0	TETT		FW
400	18.4	1,200	75	Prim.	50.0		HF	150	150	Succ.	Yes	P (Exp. L)
1,100	12.0	8,000	95	Prim.	45.0	20.0	HF	525	525	Succ.	Yes	
250	33.0	10.0		Prim.	50.0	15.0	HF	350	300	Succ.	Yes	P (Exp. L)
1,000-1,500	13.0	2,200	100	Prim.	60.0	30.0	HF	5,900	5,900	Succ.	Yes	FW
4,250	22.0	29.0	140	Prim.			HF	419	81	TETT	No	P (Exp. L)
500	13.0	1,500	95	Prim.	87.5	57.7	NC	375	375	Succ.	Yes	FW
1,100	17.0	800	100	Prim.	87.0	33.0	JS	30	20	Succ.	Yes	FW
1,800	14.0	800	100	Prim.	86.0	67.0	NC	200	200	Succ.	Yes	FW
950	13.0	800	85	Prim.	64.0	53.0	HF	700	700	Succ.	Yes	FW
1,000	12.0	2,000	100	Prim.	65.0	30.0	HF	6,000	6,000	Succ.	Yes	FW
2,300	12.0	300	130	Steam soak	55.0	27.0	HF	1,900	1,900	Succ.	Yes	FW
2,100	11.0	2,000	125	Steam soak	55.0	27.0	HF	2,500	2,500	Succ.	Yes	P(Exp. L)
1,000	14.0	1,600	95	Prim.	64.0	60.0	NC	580	450	Succ.	Yes	FW
1,000	14.0	1,600	95	Prim.	60.0	35.0	HF	24,030	22,900	Succ.	Yes	FW
500	15.0	500	74	Prim.	50.0	20.0	JS	380	380	Prom.	Yes	FW
1,300-1,500	14.0	1,525	95	Prim.	50.0	15.0	HF	1,000	950	Succ.	Yes	FW
1,920	20.0	75.0	110	Prim.	71.0	50.0	NC	800	130	Succ.	Yes	FW
850-1,800	14.5	1,900	75	Prim.	35.0	15.0	JS	3,200	2,800	Succ.	Yes	FW
700	13.0	4,000	85	Prim.	45.0	15.0	NC	3,200	2,600	Succ.	Yes	
1,300	12.0	4,000	100	Prim.	60.0	33.0		17,000	15,000	Succ.	Yes	FW
900	11.5	6,500	90	Prim.	60.0	33.0		4,300	3,500	Succ.	Yes	FW
1,200	11.0	5,000	100	Prim.	50.0	43.0		1,800	1,400	Succ.	Yes	FW
1,300	12.0	4,000	100	Prim./cyclic	60.0	20.0		3,200	1,400	Succ.	Yes	FW
500-1,000	14.0	3,000		Prim.			JS	250	200	Prom.		FW
400-1,400	13.0	1,900	95	Prim.	75.0	20.0	HF	101,000	101,000	Succ.	Yes	FW
2,600	14.0	500	120	Steam soak	49.0		JS	320	280	Succ.	Yes	FW
4,400	10.8	2,896	130	Prim.	55.0		JS	1,500	500	TETT	Yes	FW
1,600	18.0	150	100	Steam soak			HF	2,500	2,200	Succ.	Yes	FW
1,000	13.0	6,000	110	Prim.			HF	3,400	3,200	Succ.	Yes	FW
1,800	18.0	150	100	Prim.			JS	900	720	Succ.	Yes	P (Exp. L)
950	10.6	10,000		Prim.			JS	380	380	Prom.		FW
1,400	13.0	2,000	100	Prim.			JS	1,700	1,400	Prom.	Yes	
[illegible]00-1,500	13.0	6,000	85	Prim.			HF	12,000	11,436	Succ.	Yes	FW
500	12.0	10,000	100	None			JS	15	0	TETT	TETT	
1,200	11.0	8,000	95	Prim.			HF	13,000	13,000	Succ.	Yes	FW
1,300	13.0	5,000	95	Steam soak			HF	7,000	6,800	Succ.	Yes	FW
900	13.0	2,235	90	Prim.			JS	1,500	1,200	Succ.	Yes	FW
1,080	13.0	3,000	100	Prim.			JS	6,200	5,800	Succ.	Yes	FW
1,200	12.0	2,900	95	Prim.			JS	800	750	Prom.	Yes	FW
1,800	16.0	277	110	Prim.			NC	16,600	16,050	Succ.	Yes	FW
2,500	12.5	600	110	Prim.			JS	800	500	Succ.	Yes	FW
650	12.0	6,400	85	Steam soak	66.0		NC	2,800	2,800	Succ.	Yes	FW
1,400	16.0	312	92	Prim.			HF	2,300	2,300	Succ.	Yes	
1,100	16.0	145	88	Prim.			HF	250	250	Succ.	Yes	
1,000	13.0	1,800	105	Prim.			JS	1,700	1,400	Prom.		FW
600	11.0	15,300	100	Prim.			JS	15	0	TETT		FW
600-1,500	12.0		80	Prim.			HF	1,239	1,239	Succ.	Yes	FW
1,200	12.0			Prim.			HF	7,795	7,795	Succ.	Yes	FW
1,700	12.0			Prim.			HF	5,312	5,312	Succ.	Yes	FW
1,100	11.0			Prim.			JS	1,014	1,014	Succ.	Yes	FW
0				Prim.			JS	5,028	5,028	Succ.	Yes	FW
1,200	12.0			Prim.			HF	2,277	2,277	Succ.	Yes	FW

Producing thermal EOR in U.S. — continued

Operator	Field	State	County	Start date	Area, acres	— Number wells —		Pay zone	Formation type	Porosity, %	Permeability, md
						Prod.	Inj.				
Sun	Midway-Sunset	Calif.	Kern	7/84		36	0	Potter	S		
Sun	Midway-Sunset	Calif.	Kern	7/84		60	2	Potter	S		
Sun	Midway-Sunset	Calif.	Kern	1/84		127	0	Potter	S		
Tenneco	Kern River	Calif.	Kern	1972	50	41	20	Kern River Series	S	31.0	2,000
Tenneco	Kern River	Calif.	Kern	1970	80	112	33	Kern River Series	S	31.0	2,000
Tenneco	Kern River	Calif.	Kern	9/72	38	32	16	Kern River Series	S	31.0	2,500
Tenneco	Kern River	Calif.	Kern	1970	95	72	36	Kern River Series	S	33.0	4,000
Tenneco	Midway-Sunset	Calif.	Kern	1981	40	70	10	Monarch	S	30.0	3,000
Tenneco	Midway-Sunset	Calif.	Kern	4/85	30	26	5	Potter	S	34.0	3,700
Tenneco	Midway-Sunset	Calif.	Kern	1969	50	60	15	Metson	S	30.0	3,000
Tenneco	Midway-Sunset	Calif.	Kern	1984	15	12	0	Sub Lakeview	S	30.0	4,500
Tenneco	Midway-Sunset	Calif.	Kern	1983	34	13	2	L. Monarch	S	30.0	2,000
Tenneco	Midway-Sunset	Calif.	Kern	4/84	25	24	2	Potter	S	34.0	4,000
Tenneco	Midway-Sunset	Calif.	Kern	1985	22	17	5	U. Monarch	S	29.0	2,000
Tenneco	Midway-Sunset	Calif.	Kern	3/73	24	27	2	Potter	S	34.0	4,100
Tenneco	Placerita	Calif.	Los Angeles	1986	55	50	11	L. Kraft	S	28.0	3,000
Texaco	Cat Canyon	Calif.	Santa Barbara	1964	1,700	30		S1B	S	31.0	3,000
Texaco	Cat Canyon	Calif.	Santa Barbara	1977	390	80		S1A-S6	S	31.0	1,400
Texaco	Kern River	Calif.	Kern	8/62	5,070	4,457	1,469	Kern River Series	S	31.0	4,000
Texaco	Lost Hills	Calif.	Kern	1977	49	23	16	Tulare	S	38.0	2,000
Texaco	Lost Hills	Calif.	Kern	1977	35	46	11	Etchegoin	S	40.0	2,000
Texaco	McKittrick	Calif.	Kern	1984	18	16	9	Tulare	S	35.0	2,800
Texaco	Midway-North Midway	Calif.	Kern	11/81	40	61	16	Potter	S	30.0	3,400
Texaco	Midway-Reward	Calif.	Kern	2/77	10	35	9	Potter	S	33.0	3,000
Texaco	Midway-Santiago Creek	Calif.	Kern	12/83	10	10	4	Tulare	S	34.0	2,500
Texaco	Midway-Sec 35	Calif.	Kern	1984	7.5	16	5	Potter	S	35.0	2,000
Texaco	Midway-Sec 35	Calif.	Kern	1977	10	13	6	Potter	S	35.0	2,000
Texaco	Midway-Security	Calif.	Kern	11/77	30	43	20	Potter	S	33.0	5,000
Texaco	San Ardo	Calif.	Monterey	7/87	51	24	7	Lombardi	S	32.0	5500
Texaco	San Ardo	Calif.	Monterey	1965	1,108	231	13	Aurignac	S	39.0	2,200
Texaco	Sour Lake	Tex.	Hardin	3/85	8	12	4	Miocene OB-2	S	33.3	1,000
Texaco	Sour Lake	Tex.	Hardin	11/81	19.8	24	12	Miocene OB-1	S	35.5	1,436
Texaco	Sour Lake	Tex.	Hardin	6/84	7	8	4	Miocene OB-4	S	35.0	900
Union Pacific Resources	Wilmington	Calif.	Los Angeles	7/82	20	9	4	Tar	S	30.1	2780
Unocal	Cymric	Calif.	Kern	1964	300	179	0	Tulare	S	35.0	1,000
Unocal	Gato Ridge	Calif.	Santa Barbara	1970	130	16	0	Sisquoc Sib & S2	S	32.0	2,500
Unocal	Guadalupe	Calif.	San Luis	1955	2,970	114	0	Sisquoc	S	35.0	1,550
Unocal	McKittrick	Calif.	Kern	8/83	17	21	8	Tulare	S	36.0	1000-2000
Unocal	McKittrick	Calif.	Kern	6/77	131	37	15	Amnicola	S	37.0	1000-2000
Unocal	Midway-Sunset	Calif.	Kern	1983	80.5	61	0	Tulare	US	31.0	1,146
Unocal	Midway-Sunset	Calif.	Kern	6/77	39	48	18	Potter	S	24.0	1,500
Unocal	Midway-Sunset	Calif.	Kern	1/85	5.2	9	4	Potter	US	34.5	3,700
Unocal	Midway-Sunset	Calif.	Kern	1974	80.5	46	17	Potter	US	34.5	3,700
Unocal	Midway-Sunset	Calif.	Kern	5/69	161	184	0	Potter	S	24.0	1,500
Unocal	North Belridge	Calif.	Kern	11/65	160	12	0	Tulare	S	38.0	2,500
Unocal	South Belridge	Calif.	Kern	3/85	167	12	0	Tulare	S	38.0	4,000
Unocal	Tensleep	Wyo.	Natrona	5/81	18	5	2	Tensleep	S	18.0	500
Hot water											
ARCO	Midway-Sunset	Calif.	Kern	8/85	6	6	2	Tulare	S	33.0	2,500
Mobil	South Belridge	Calif.	Kern	11/82	246	58	22	Tulare	S	35.0	3,000
Tenneco	Kern River	Calif.	Bakersfield	1986	50	45	10	Kern River Series	S	31.0	3,000
Tenneco	Kern River	Calif.	Bakersfield	1986	28	42	11	Kern River Series	S	31.0	2,500
Texaco	Lost Hills	Calif.	Kern	1/86	38	31	13	Etchegoin	S	40.0	2000
Texaco	Lost Hills	Calif.	Kern	1/86	11	13	4	Tulare	S	38.0	2000
Texaco	McKittrick	Calif.	Kern	1981	12	18	9	Potter	S	35.0	4,000
Texaco	Midway-Sec 35	Calif.	Kern	3/87	10	16	6	Potter	S	35.0	2000
Texaco	San Ardo	Calif.	Monterey	9/86	95	41	9	Aurignac	S	33.0	3000
Unocal	McKittrick	Calif.	Kern	6/87	70	25	14	Amnicola	S	37.0	1,500
Combustion projects											
Bayou State	Bellevue	La.	Bossier	1970	180	82	15	Nacatoch	S	32.0	650
Chevron	W. Heidelberg Cotton Valley Unit	Miss.	Jasper	12/71	362	9	3	Cotton Valley 4 & 5	S	14.0	85
Greenwich Oil	Forest Hill	Tex.	Wood	9/76	1,900	100	21	Harris Sand	S	28.0	950
Mobil	Midway-Sunset	Calif.	Kern	1/60	150	32	6	Moco	S	36.0	1,500
Mobil	Lost Hills	Calif.	Kern	4/61	164	33	10	Tulare	S	42.6	1,790
Mobil	West Newport	Calif.	Orange	1958	300	139	36	Miocene	S	37.0	500-1,000
Oxy USA	Bellevue	La.	Bossier	1971	180	186	48	Nacatoch	S	33.9	700
Santa Fe Energy	Midway-Sunset	Calif.	Kern	1982	24	40	10	Potter	S	32.5	200-4,000
Texaco	Bellevue	La.	Bossier	9/63	385	183	28	Nacatoch	S	33.0	960

Producing CO_2, gas EOR in U.S.

Operator	Field	State	County	Start date	Area, acres	— Number wells —		Pay zone	Formation type	Porosity, %	Permeability, md
						Prod.	Inj.				
CO_2 miscible											
ARCO	North Coles Levee	Calif.	Kern	6/81	70	7	1	Stevens	S	19.5	9
ARCO	Sho-Vel-Tum	Okla.	Stephens	9/82	1,100	69	41	Sims	S	16.0	70
ARCO	Sable	Tex.	Yoakum	3/84	825	32	21	San Andres	Dolo.	8.4	1.5
ARCO	Wasson-Willard	Tex.	Yoakum	1/86	8,000	286	225	San Andres	Dolo.	9.0	1.3
Amoco	Levelland	Tex.	Hockley	8/78	15	1	4	San Andres	Dolo.	11.8	3.8
Amoco	Levelland	Tex.	Hockley	3/73	13.2	2	6	San Andres	Dolo.	11.5	3.5

Depth, ft	Reservoir oil			Previous prod.	Residual saturation %		Project maturity†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
	Gravity, °API	cp	°F.		Start	End						
0				Prim.			JS	346	346	Succ.	Yes	FW
0				Prim.			JS	700	700	Succ.	Yes	FW
1,100	11.0			Prim.			JS	2,736	2,736	Succ.	Yes	FW
800	13.0	8,000	90	Steam soak	60.0	15.0	NC	1,600	1,500	Succ.	Yes	FW
600	13.0	5,000	78	Prim.	63.0	15.0	HF	1,100	1,100	Succ.	Yes	FW
900	13.0	7,000	84	Prim.	70.0	15.0	HF	650	650	Succ.	Yes	FW
1,200	13.0	8,000	90	Steam soak	55.0	20.0	NC	1,200	1,100	Succ.	Yes	FW
1,200	13.0	30.0	200	Steam soak	45.0	20.0	HF	1,300	700	Succ.	Yes	FW
1,500	11.5	10,000	95	Steam soak	62.0	15.0	JS	900	700	Succ.	Yes	FW
1,100	11.4	1,200	130	Prim.	75.0	57.0	NC	800	250	TETT	TETT	FW
1,300	13.0	4,000	90	Prim.	60.0	20.0	JS	120	100	Succ.	Yes	FW
1,500	12.0	5,000	86	Cyclic steam	60.0	30.0	JS	300	200	Succ.	Yes	FW
1,600	11.5	10,000	95	Steam soak	67.0	15.0	HF	700	500	Succ.	Yes	FW
1,300	12.5	5,000	86	Steam soak	60.0	30.0	JS	600	500	Prom.	Yes	FW
1,600	11.5	7,000	95	Steam soak	55.0	15.0	NC	900	850	Succ.	Yes	FW
1,800	12.0	7,500	100	Prim.	62.0	15.0	JS	420	420	TETT	TETT	FW
2,300	8.0	100,000	100	None			NC	200	200	Succ.	Yes	
2,500	7.0	50-100000	110	None			NC	2,800	2,800	Succ.	Yes	FW
1,000	13.0	4,060	90	Prim.	70.0	30.0	HF	87,600	87,600	Succ.	Yes	FW
200	13.0	20.0	220	Steam stimulation	70.0	30.0	NC	530	520	Succ.	Yes	FW
400	13.0	10.0	250	Steam stimulation	63.0	30.0	NC	950	900	Succ.	Yes	FW
1,000	13.0	35.0	220	Steam stimulation	60.0	30.0	HF	80	70	Disc.	No	P (Exp.UL)
1,000	13.0	1,500	90	Steam stimulation	60.0	20.0	HF	2,480	1,370	Succ.	Yes	FW
1,300	13.0	1,500	90	Steam stimulation	60.0	20.0	HF	1,125	900	Succ.	Yes	FW
1,300	12.0	1,500	90	Steam stimulation	60.0	20.0	HF	300	300	Prom.	Yes	P (Exp. L)
1,600	12.0	1,500	90	Steam soak	55.0		HF	650	450	Succ.	Yes	FW
1,600	12.0	6,500	90	Steam soak	55.0	20.0	NC	330	180	Succ.	Yes	P (Exp. L)
950	12.0	1,500	90	Steam stimulation	60.0	20.0	NC	2,040	800	Succ.	Yes	FW
1,900	11.0	1,200	135	Cyclic steam	58.0	15.0	JS	1,057	1,057	TETT	No	P (Exp. L)
2,200	13.0	4,500	100	Cyclic	58.0	24.0	NC	6,876	6,876	Succ.	Yes	FW
2,000	16.2	100	95	Prim.	50.0	20.0	NC	140	140	Succ.	Yes	FW
1,000	14.7	665	90	Prim.	53.0	17.0	NC	300	300	Succ.	Yes	P (Exp. L)
1,600	16.2	107	100	Prim.	50.0	20.0	NC	200	200	Succ.	Yes	FW
2,563	14.0	283	123	WF	55.0	20.0	HF	400	400	Succ.	Yes	P (Exp. L)
1,100	13.0			Prim.	65.0	45.0	NC	5,230	4,340	Succ.	Yes	FW
1,900	10.5	1,450	130	Prim.	65.0	49.0	HF	60	5	Disc.	No	FW
3,000	9.0	580	85	Prim.	80.0	60.0	HF	1,200	500	Succ.	Yes	FW
850	11.4	1,000	140	Steam soak	60.0	27.0	NC	650	545	Succ.	Yes	FW
1,100	11.3	500	170	Steam soak	60.0	36.0	NC	610	425	Succ.	Yes	FW
700	11.4	10,000	100	Prim.	54.0	37.8	HF	730	425	Succ.	Yes	FW
1,000	11.3	100	220	Steam soak	55.0	34.0	NC	2,200	1,960	Succ.	Yes	FW
1,100	11.4	10,000	110	Steam drive	52.0	28.0	NC	719	109	Succ.	Yes	FW
1,100	11.4	10,000	110	Steam soak	57.2	32.3	HF	2,780	2,550	Succ.	Yes	P (Exp. L)
1,000	11.3	500	170	Prim.	57.0	35.0	NC	3,600	2,680	Succ.	Yes	FW
800	13.6	450	130	Prim.	63.0	49.0	HF	108	0	Disc.	No	FW
1,250	13.2	450	130	Prim.	66.0	52.0	JS	103	0	Disc.	No	FW
2,500	14.0	580	90	Prim.	67.0	30.0	HF	370	270	Prom.	No	P
1,000	11.0	24,000	100	Steam flood			HF	54	11	Succ.	Yes	P (Exp, UL)
1,000	14.0	1,600	95	Steam flood	40.0	30.0	JS	2,250	2,080	TETT	Yes	P
900	13.5	8,000	90	Steam drive	30.0	20.0	JS	250	150	Succ.	Yes	FW
600	13.5	5,000	78	Steam drive	35.0	20.0	JS	200	50	TETT	Yes	FW
400	13.0	10.0	250	Steam flood			JS	110	100	TETT	Yes	P (Exp. L)
200	13.0	20.0	250	Steam flood			JS	170	165	Succ.	Yes	P (Exp. L)
1,100	13.0	40.0	210	Steam flood	50.0	30.0	HF	90	20	Disc.	No	P (Exp. UL)
1,600	12.0	38.0	200	Steam flood			JS	400	220	TETT	Yes	P (Exp. L)
2,200	13.0	4,000	100	Steam drive	38.0	31.0	JS	570	100	TETT	Yes	P (Exp. L)
1,100	12.0	30.0		Steam drive	41.0	31.0	JS	290	0	TETT		FW
400	19.0	660		Prim.	94.0	49.0	HF	400	400	Succ.	Yes	FW
11,300	18-27.0	6.00	221	Prim.	80.0		NC	565	565	Succ.	Yes	FW
5,000	10.0	1,006	185	Prim.	63.0	32.0	JS	1,050	1,050	Prom.	No	FW
2,700	14.0	110	125		74.0	37.0	HF	790	790	Succ.	Yes	FW
300	15.0	410	95	Prim.	63.0	22.0	NC	520	520	Succ.	Yes	FW
1,600	13.0	750	100	Prim.	86.0	37.0	HF	1,100	1,100	Succ.	Yes	FW
300-400	19.0	676	75	Prim.	72.0	32.0	NC	300	300	Succ.	Yes	FW
1,700	11.5	2,770	110	Prim./drive/cyclic	70.0	<10.0	JS	1,000	800	Prom.	TETT	
350	19.0	675	130	Prim.	60.0	28.5	NC	1,000	1,000	Succ.	Yes	FW

Table F

Depth, ft	Reservoir oil			Previous prod.	Residual saturation %		Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
	Gravity, °API	cp	°F.		Start	End						
9,000	36.0	0.45	235	Prim.	34.0	25.8	HF	80		Disc.	No	P (Exp. UL)
6,200	25.0	3.30	115	WF	59.0	42.0	HF	2,200	1,100	Succ.	Yes	FW
5,200	32.0	1.46	107	WF			JS	685	100	Prom.	Yes	FW
5,100	32.0	2.01	110	WF			JS	4,393	0	TETT		FW
4,900	30.0	2.30	105	WF	43.0	[illegible]	[illegible]	5	5	Succ.		P (Exp. L)
4,900	30.0	2.30	105	WF	74.0	[illegible]	[illegible]	38	38	Succ.		P (Exp. L)

Producing CO_2, gas EOR in U.S, — continued

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Amoco	North Cowden Unit	Tex.	Ector	6/85	12	2	6	Grayburg	Dolo./ LS	10.0	5.4
Amoco	Slaughter	Tex.	Hockley	1984	6,412	229	71	San Andres	Dolo./ LS	10.0	9
Amoco	Slaughter	Tex.	Hockley	12/84	1,600	72	50	San Andres	Dolo./ LS	10.0	4
Amoco	Slaughter	Tex.	Hockley	12/84	5,700	215	127	San Andres	Dolo./ LS	13.0	7
Amoco	Wasson	Tex.	Yoakum	12/84	7,800	321	282	San Andres	Dolo./ LS	9.0	5
Amoco	Wertz	Wyo.	Carbon, Sweetwater	10/86	1,400			Tensleep	S	10.0	20
Chevron	Rangely Weber Sand	Colo.	Rio Blanco	10/86	15,000	234	70	Weber SS	S	12.0	5-50
Chevron	Quarantine Bay	La.	Plaquemines	10/81	57	2	1	4 Sand Reservoir	S	30.0	100-1,000
Chevron	Timbalier Bay	La.	Lafourche	4/84	37	2	1	S-2B	S	30.0	9,244
Chevron	Kurten	Tex.	Brazos	8/81	672	5	4	Woodbine	S	12.0	0.4
Chevron	Pittsburg	Tex.	Camp	6/85	43	4	1	Pittsburg	Limey Sand	11.0	2.4
Chevron	SACROC Unit	Tex.	Scurry	1/72	49,900	732	387	Canyon Reef	LS	3.9	19.4
Conoco	Ford Geraldine Unit	Tex.	Reeves & Culberson	2/81	3,850	86	60	Delaware	S	23.0	64
Enron Oil & Gas	Twofreds	Tex.	Loving, Ward & Reeves	1/74	4,392	42	33	Delaware	S	19.5	32
Exxon	Corduna Lake	Tex.	Crane	12/85	3,516	33	13	Devonian	Dolo.	22.0	3.5
Exxon	Means (San Andres)	Tex.	Andrews	11/83	6,700	368	214	San Andres	LS	9.0	20
Exxon	Slaughter	Tex.	Hockley	5/85	569	20	11	San Andres	Dolo.	12.5	6.3
Exxon	Wasson (Cornell Unit)	Tex.	Yoakum	7/85	1,923	62	38	San Andres	Dolo.	8.6	1.9
George R. Brown Prtshp.	Rose City South	Tex.	Orange	1/83	900	8	2	Hackberry	S	37.0	4,500
George R. Brown Prtshp.	Rose City North	Tex.	Orange	4/81	800	8	5	Hackberry	S	37.0	4,500
Mitchell Energy	Alvord South	Tex.	Wise	1980	2,291	17	3	Caddo	Congl.	12.8	55
Mobil	GMK South	Tex.	Gaines	1982	1,143	26	27	San Andres	LS	9.8	3.1
Mobil	McElmo Creek Unit	Utah	San Juan	2/85	13,440	170	100	Ismay Desert Creek	LS	14.0	5
Mobil	Wasson	Tex.	Yoakum	10/85	640	29	14	San Andres	Dolo.	13.0	6.2
Oxy USA	Welch	Tex.	Dawson	2/82	2,675	140	119	San Andres	LS	9.3	9
Oxy USA	Northeast Purdy	Okla.	Garvin	9/82	8,320	106	102	Springer	S	13.0	44
Pennzoil	Richardson	W.V.	Calhoun, Roane	8/86	78	8	4	Berea	S	14.0	40
Pennzoil	Tinsley	Miss.	Yazoo	11/81	1,338	15	15	Perry	S	26.4	49
Phillips	E. Vacuum	N.M.	Lea	2/81	4,900	192	100	San Andres	Dolo.	11.7	11
Santa Fe Energy	Raymond	Mont.	Sheridan	8/83	685	2	1	Nisku	LS	8.2	13
Shell Offshore	West Mallalieu	Miss.	Lincoln	11/86	5,760	9	9	Lower Tuscaloosa	S	25.0	20
Shell Offshore	Olive	Miss.	Pike	10/87	1,280	16	6	Lower Tuscaloosa	S	26.0	50
Shell Western E&P	Crossett (N. Cross)	Tex.	Crane & Upton	4/72	1,500	23	11	Devonian	Tripol. chert	22.0	5
Shell Western E&P	Little Creek	Miss.	Lincoln & Pike	12/85	6,200	55	20	Lower Tuscaloosa	S	23.0	33
Shell Western E&P	Wasson	Tex.	Yoakum	4/83	20,000	1,195	805	San Andres	Dolo.	12.0	8
Shell Western E&P	Wasson	Tex.	Gaines	1/86	3,500	110	43	Clearfork	Dolo.	6.0	3
Stanberry Oil	Hansford Marmaton	Tex.	Hansford	6/80	2,010	9	10	Marmaton	S	16.5	52
Stanberry Oil	Farnsworth, North	Tex.	Ochiltree	6/80	1,431	9	5	Marmaton B	LS	11.5	140
Texaco	Paradis	La.	St. Charles	2/82	347	7	4	Lower 9000-Foot	S	26.0	770
Texaco	Paradis	La.	St. Charles	2/82	320	4	3	No. 8	S	27.0	795
Texaco	Bay St. Elaine	La.	Terrebonne	1/81	9	2	1	8000-Foot	S	32.9	1,480
Union Texas Petroleum	Wellman	Tex.	Terry	7/83	1,400	32	7	Wolfcamp	LS	9.2	>100
Unocal	Dollarhide	Tex.	Andrews	5/85	6,183	83	66	Devonian	Dolo./ Tripol.	13.5	9
CO_2 immiscible											
Chevron	Pittsburg	Tex.	Camp	11/83	40	1	0	Sub-Clarksville	S	23.0	460
Chevron	Heidelberg	Miss.	Jasper	12/83	40	1	0	Eutaw	S	25.0	74
Chevron	Timbalier Bay	La.	Lafourche	12/85	422	10		4900 Foot Sand	S	32.0	500-2,500
Exxon	Pewitt Ranch	Tex.	Titus	6/83		1		Paluxy	S	24.0	1000-1500
Marathon Oil	Yates	Tex.	Pecos & Crockett	11/85	14,300	958	27	Grayburg/San Andres	Dolo.	17.0	175
Shell Western E&P	Weeks Island	La.	New Iberia	1978	8	2	1	S RES B	S	26.0	1,800
Union Pacific Resources	Wilmington	Calif.	Los Angeles	3/81	41	3	4	Tar	S	24.0	465
Union Pacific Resources	Wilmington	Calif.	Los Angeles	2/84	156	10	12	Tar	S	24.0	465
Hydrocarbon miscible											
ARCO	Prudhoe Bay	Alaska	Prudhoe Bay	12/82	3,650	42	11	Sadlerochit	S	23.0	300
ARCO	Chandeleur Sound Block 25	La.	St. Bernard	1/83	342	11	3	4800 ft. Sand	S	21.3	1,980
ARCO	Chandeleur Sound Block 25	La.	St. Bernard	1/83	941	48	17	BB	S	33.0	1,680
ARCO	South Pass Block 61	OCS		8/83	26	1	1	LL RG	S	33.0	10
ARCO	South Pass Block 61	OCS		8/83	55	1	1	I RK2	S	30.0	25
ARCO	South Pass Block 61	OCS		5/81	54	4	2	MM RBB	S	30.0	300
ARCO	South Pass Block 61	OCS		5/81	112	5	2	UM RBB	S	30.0	300
ARCO	South Pass Block 61	OCS		5/81	320	6	3	UM RAAO, 2, 3	S	30.0	180
ARCO	South Pass Block 61	OCS		8/83	39	2	1	UJ RL	S	33.0	50
ARCO	South Pass Block 61	OCS		8/85	54	2	1	LL RBB1, 2	S	30.0	175
ARCO	South Pass Block 61	OCS		5/81	179	5	3	MM RAAO, 2, 3	S	30.0	180
ARCO	South Pass Block 61	OCS		2/84	37	2	1	LL ART	S	30.0	50
ARCO	South Pass Block 61	OCS		10/84	68	3	3	LK2 RU	S	29.0	100
ARCO Alaska/Standard Alaska	Prudhoe Bay	Alaska		2/87	13,500	157	43	Sadlerochit	S	22.0	500
Amoco	Levelland	Tex.	Hockley	5/71	1,200	40	28	San Andres	Dolo.	10.2	2.1
Exxon	South Pass Block 89	Tex.	Gulf of Mexico	12/83		12	9	X and Y Series	S	21.0	10-1,500
Hunt	Fairway	Tex.	Anderson/ Henderson	3/66	22,618	118	64	James	LS	12.6	11
Phillips	Bridger Lake	Utah	Summit	4/70	3,800	7	1	Dakota	S	12.8	79
Sun E&P	Fordoche W-12	La.-	Pt. Coupee	5/80	3,400	5	5	Wilcox	S	19.0	4.6
Sun E&P	Fordoche W-8	La.	Pt. Coupee	5/80	3,300	8	3	Wilcox	S	20.0	8.6

Depth, ft	Reservoir oil Gravity, °API	cp	°F.	Previous prod.	Residual saturation % Start	End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
4,300	34.0	1.67	94	WF			JS	20	20	Succ.		P
4,900	31.0	1.40	105	WF			JS	4,400	1,200	Prom.	Yes	FW
4,950	31.0	1.40	105	WF			JS	2,715	400	Succ.	Yes	FW
4,950	31.0	1.40	105	WF			JS	8,311	1,500	Succ.	Yes	FW
5,100	32.0	1.30	110	WF			JS	15,438	3,500	Succ.	Yes	FW
6,000	35.0	1.116	163	WF			JS	10,000	6,600	Prom.	Yes	FW
5,500-6,500	35.0	1.70	160	Prim./WF	38.0	29.0	JS	32,650	4,500	Prom.		FW
8,120	32.0	0.99	183	Prim.	55.0	15.0	HF			Prom.	No	
7,400	39.0	0.39	180	Prim.	29.0		HF	0	0	TETT	No	P (Exp. L)
8,300	38.0	0.40	230	Prim.	40.0		JS	182	156	Prom.		P
8,000	41.0		205	WF	59.0		NC	130	36	Prom.	Yes	P (Exp. L)
6,700	41.0	0.35	130	Prim./WF	63.3	46.8	NC	32,416	17,634	Succ.	Yes	FW
2,680	40.0	1.40	83	Prim./WF			JS	1,150	1,150	Succ.	No	FW
4,900	36.0	1.50	105	WF			NC	700	700	Succ.	Yes	FW
3,200	40.0	0.50	101	WF			JS			TETT	TETT	
4,300	29.0	6.00	97	WF			JS			TETT	TETT	
4,900	32.0	1.30	110	WF			JS			TETT	TETT	
4,500	33.0	1.00	106	WF			JS			TETT	TETT	
8,200	37.0	2.00	180	WF	50.0	35.0	HF	811	600	Prom.		FW
8,200	37.0	2.00	180	WF	50.0	35.0	HF	160	160	Prom.		FW
5,700	44.0	0.39	154	WF	60.0	52.0	HF	490	215	Prom.	No	FW
5,400	30.0	2.57	101	WF	55.0	28.0	JS	2,000	200	Prom.	Yes	LW
5,600	41.0	0.50	125	Prim./WF	50.0		JS	5,300	900	Prom.	Yes	FW
5,100	33.0	0.97	110	WF	54.4	39.2	JS	1,654	150		Yes	FW
4,890	34.0	2.15	96	WF	30.0	18.0	HF	1,940	155	TETT	TETT	FW
9,400	38.0	1.20	148	WF	46.0	40.0	NC	3,500	1,800	Succ.	TETT	FW
2,300	46.0	3.00	80	WF	48.0		JS	80	40	Prom.	No	P
4,800	39.0	1.50	175	WF	65.0	38.0	HF	300	300	Prom.	No	FW
4,500	38.0	1.00	101	Prim.	70.0	50.0	JS	9,500		Succ.	Yes	FW
7,900	40.0	0.40	178	Prim.			JS	90	50	Prom.	Yes	
10,365	38.0	0.50		Prim.	15.0	1.0	JS	400	400	TETT	TETT	FW
10,500	39.0	0.34		WF	17.0	2.0	JS			TETT	TETT	FW
5,300	44.0	0.36	106	Residue gas inj.	34.0	22.0	HF	1,925	1,925	Succ.	Yes	FW
10,640	38.0	0.40	248	WF	21.0	2.0	JS	3,500	3,500	Prom.	TETT	
5,200	33.0	1.30	105	WF	40.0	27.0	JS	43,600	11,000	Succ.	Yes	FW
6,700	33.0	1.20	105	WF	60.0		JS	6,200	0	Prom.		FW
6,500	44.0	1.56	135	Prim.	43.0		HF	553	553	Succ.	Yes	FW
6,400	44.0	1.61	135	WF	57.0		HF	470	470	Succ.	Yes	FW
10,400	37.0	0.50	205	Prim.	62.0	48.0	HF	400	400	Prom.	No	FW
8,600	39.0	0.40	192	Prim.	30.0	20.0	NC	125	125	Prom.	No	RW
7,400	36.0	0.67	170	Prim.	20.0	5.0	NC	10	10	Disc.	No	RW
9,800	43.5	0.54	151	WF	35.0	10.0	JS	3,600	400	TETT	TETT	FW
8,000	40.0	0.44	122	Prim./WF	35.0	22.0	JS	3,000	2,200	TETT	TETT	FW
3,800	14.0	2,200	120	Prim.	65.0		NC	15	5	Prom.	No	P
5,060	20.0	15.0	150	Prim.			NC	25		Disc.	No	P (Exp. UL)
4,878	26.0	1.70	138	Prim.	60.0		HF	124	95	Prom.	Yes	FW
4,500	19.0	30.0	160	Prim.			JS					
1,100-1,700	30.0	5.50	82	Gas inj.			JS	72,316		TETT	TETT	FW
12,760	32.0	0.50	225	WF	22.0	2.0	NC	20	20	Succ.	No	P (Exp. L)
2,500	14.0	283	123	WF	51.0	30.0	HF	50	50	Succ.	No	P
2,500	14.0	283	123	WF	51.0	30.0	JS	250	250	Succ.	No	FW
8,800	27.0	0.90	200	Prim.	65.0	25.0	JS	50,000	5,000	Prom.		P (Exp. L)
4,800	27.0	3.50	120	Prim.	45.0	30.0	HF	863	786	Succ.	Yes	FW
5,450	27.0	3.45	132	Prim.	45.0	30.0	HF	3,430	2,428	Succ.	Yes	FW
6,800	43.0	0.40	170	Prim.	73.0	31.0	HF	50	5	Succ.	Yes	FW
4,900	39.0	0.70	150	Prim.	65.0	25.0	NC	57	6	Succ.	Yes	FW
6,400	37.0	0.70	165	WF	78.0	27.0	HF	2,150	1,040	Succ.	Yes	FW
6,300	37.0	0.70	165	WF	78.0	27.0	HF	1,200	1,200	Succ.	Yes	FW
9,000	38.0	0.30	190	WF	78.0	25.0	HF	2,867	2,867	Succ.	Yes	FW
5,500	40.0	0.40	150	Prim.	77.0	26.0	NC	237	24	Succ.	Yes	FW
5,750	29.0	1.70	158	Prim.	66.0	28.0	HF	256	148	Succ.	Yes	FW
9,100	38.0	0.30	190	WF	76.0	26.0	HF	2,431	2,431	Succ.	Yes	FW
8,500	33.0	0.86	190	Prim.	70.0	30.0	HF	162	41	Succ.	Yes	FW
7,900	36.0	0.50	180	Prim.	67.0	27.0	HF	745	209	Succ.	Yes	FW
8,800	27.0	0.90	200	WF	50.0	25.0	JS	300,000	0	TETT		FW
4,900	30.0	2.30	105	Prim.	90.0		HF	3,000	3,000	Succ.		P (Exp. UL)
11,270	38-40.0	0.4-0.6	165	Prim.			JS			TETT	TETT	
9,900	48.0	0.15	260	Prim.	73.0	36.0	NC	6,600	6,600	Succ.	Yes	FW
15,600	40.0	0.36	225	Prim.	70.0	61.0	NC	600	150	Succ.	Yes	FW
13,650	45.0	0.13	274				HF	320		Succ.	Yes	FW
13,200	44.0	0.13	267				HF	697		Succ.	Yes	FW

Producing CO_2, gas EOR in U.S, — continued

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
True Oil	Red Wing Creek	N. Dak.	McKenzie	1/82	640	8	1	Mission Canyon	LS	10.0	0.1
Hydrocarbon immiscible											
ARCO Alaska	Kuparuk River	Alaska		2/86	15,360	49	47	Kuparuk "A" Sand	S	22.0	50
Nitrogen											
Chevron	East Painter	Wyo.	Uinta	11/83	1,500	17	7	Nugget	S	11.0	3
Chevron	Stonebluff	Okla.	Wagoner	3/82	540	18	15	Dutcher	S	16.0	200
Chevron	Painter	Wyo.	Uinta	6/80	1,360	39	19	Nugget	S	11.9	4
Exxon	Blackjack Creek	Fla.	Santa Rosa	2/81	4,600	8	8	Smackover	LS	16.0	112
Exxon	Jay-Little Escambia Creek	Fla./Ala.	Santa Rosa/ Escambia	1/81	14,415	60	33	Smackover	LS	14.0	35
Exxon	Fanny Church	Ala.	Escambia	1985	600	3	1	Smackover	LS	12.0	4.5
Phillips	Binger	Okla.	Caddo	1977	12,960	62	30	Marchand	S	7.5	0.2
Phillips	Andector Ellenburger	Tex.	Ector	11/81	1,931	22	3	Ellenburger	Dolo.	3.8	2,000
Unocal	Chunchula Fieldwide Unit	Ala.	Chunchula	4/82	23,279	37	8	Smackover Carbonate	Dolo.	12.4	10
Flue gas											
ARCO	Block 31	Tex.	Crane	6/49	7,840	191	74	Devonian	LS	12.0	5.4
Exxon	Hawkins	Tex.	Wood	4/77	10,590	491	41	Woodbine	S	28.0	3,400

Producing chemical EOR projects in U.S.

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Polymer											
ARCO	So. Eunice/Langlie Mattix	N.M.	Lea	8/82	2,240	39	27	Seven Rivers Queen	S	11.0	1.3
ARCO	Healdton Area III	Okla.	Carter	10/83	1,500	193	44	Penn	S	23.0	115
ARCO	Walnut Bend Unit I	Tex.	Cooke	11/83	2,487	22	18	Winger	S	17.0	103
ARCO	C-H	Wyo.	Campbell	8/84	40	3	1	Minnelusa	S	20.6	80
ARCO	Hamilton Dome	Wyo.	Hot Spring	10/84	127	14	5	Tensleep	S	14.0	58
ARCO	West Nelson Rozet	Wyo.	Campbell	3/84	440	2	2	Minnelusa	S	17.0	170
ARCO	West Rozet	Wyo.	Campbell	9/84	120	3	2	Minnelusa	S	17.0	170
Amoco	Sleepy Hollow	Neb.	Red Willow	2/85	1,600	41	10	Reagan Sand	S	24.0	2,900
Anderson Oil	North Glo	Wyo.	Campbell	10/87	292	4	2	Minnelusa	S	15.9	150
Cenex	Sage Spring Creek-Unit A	Wyo.	Natrona	8/78	1,456	8	5	Dakota	S	13.0	50
Chevron	W. Bay	La.	Plaquemines	10/81	42	4	1	3A Sand	S	34.0	4,600
Chevron	W. Bay	La.	Plaquemines	10/81	64	3	2	3A Sand	S	30.0	40
Chevron	N. Stanley	Okla.	Osage	2/76	810	18	11	Burbank	S	18.0	300
Chevron	S. Stanley	Okla.	Osage	6/83	1,280	10	16	Burbank	S	18.0	300
Chevron	C-Bar	Tex.	Crane	6/83	2,600	56	32	San Andres	Dolo.	10.0	6
Chevron	Dune	Tex.	Crane	3/82	410	26	14	San Andres	Dolo.	14.0	28
Chevron	Goldsmith 5600	Tex.	Ector	9/83	3,840	139	51	Clearfork	Dolo.	15.0	28
Chevron	McElroy	Tex.	Crane	10/82	3,200	242	56	Grayburg	Dolo.	13.0	6
Chevron	N. Ward Estes	Tex.	Ward	12/81	17,986	785	666	Yates	S	18.0	10
Conoco	Vacuum-State 35 Lease	N.M.	Lea	3/83	240	8	9	Grayburg/San Andres	S/LS	10.9	13.7
Enron Oil & Gas	Isenhour	Wyo.	Sublette	7/80	173	4	2	Almy	S	15-20.0	1-25
Enron Oil & Gas	Long Island-Star Corral	Wyo.	Sublette	8/69	173	5	2	Almy	S	15.5	1-50
Enron Oil & Gas	McDonald Draw 1TB	Wyo.	Sublette	1/72	435	1	1	Almy	S	16.7	2-59
Enron Oil & Gas	McDonald Draw 4TB	Wyo.	Sublette	7/72	420	13	10	Almy	S	18.0	1-200
Enron Oil & Gas	Ruben	Wyo.	Sublette	12/70	800	12	6	Almy	S	14.1	1-56
Enron Oil & Gas	Saddle Ridge Unit	Wyo.	Sublette	12/74	376	9	8	Mesaverde	S	22.0	10-95
Exxon	Loudon	Ill.	Fayette	1985		760	554	Chester	S	19.0	30-500
Exxon	Omaha	Ill.	Gallatin	1984		15	4	Chester	S	18.0	20-387
Exxon	Roland	Ill.	White	1985		16	14	Chester	S	15.7	16-626
Exxon	Roland	Ill.	White/Gallatin	1985		12	8	Chester	S	19.5	113-279
Exxon	Trapp	Kan.	Russell	1984		15	9	Lansing/Kansas City	LS	18.4	0.1-300
Exxon	W. Yellow Creek	Miss.	Wayne	9/76	4,813	51	24	Eutaw	S	24.0	112
Exxon	Camrick	Okla.	Beaver/Texas	1984		43	27	Upper Morrow	S	15.0	1-250
Exxon	Hewitt	Okla.	Carter	3/81	886	85	52	Hewitt	S	21.0	175
Exxon	Conroe	Tex.	Montgomery	1985				2B	S		50-5,500
Exxon	Webster	Tex.	Harris	1985		7	3	Frio 1A	S	28.0	206
Fina Oil and Chemical	Garza	Tex.	Garza	10/82	120	10	5	San Andres	LS	19.8	4.1
Fina Oil and Chemical	Westbrook	Tex.	Mitchell	12/80	4,740	153	38	Clearfork	LS	7.4	6.3
Fina Oil and Chemical	South Cowden	Tex.	Ector	6/84	666	20	7	Grayburg	Dolo.	10.1	4.1
Gallagher Drilling	Stewart East Minnelusa Unit	Wyo.	Campbell	7/82	200	4	.1	Minnelusa	S	15.6	250
Graham Resources	Carthage	Tex.		12/82		16	9	Morrow	S	19.0	200
Hunt	East Texas	Tex.	Rusk	8/82	508	78	14	Woodbine	S	22.0	300
Marathon Oil	Main Consolidated	Ill.	Crawford	7/81	130	8	12	Robinson	S	18.0	115
Marathon Oil	Yates	Tex.	Pecos	12/83	6,900	313	270	Queen Grayburg/ San Andres	Dolo.	15.0	62
Marathon Oil	Byron	Wyo.	Big Horn	12/82	1,500	51	39	Embar/Tensleep	LS/S	13.9	4.5/78
Marathon Oil	Grass Creek	Wyo.	Hot Springs	10/85	740	40	18	Phosphoria/Tensleep	LS/S	21.6/13.1	20/112
Marathon Oil	Kinney Coastal	Wyo.	Park/Big Horn	11/84	1,500	36	23	Tensleep	S	11.2	50
Marathon Oil	Oregon Basin-North Embar Tensleep	Wyo.	Park	11/83	3,000	152	79	Embar/Tensleep	LS/S	20.2/14.7	68/193
Marathon Oil	Oregon Basin-SETPA	Wyo.	Park	1/85	6,108	180	33	Embar/Tensleep	LS/S	15.9/19.5	39/140
Mitchell Energy	Alba Northeast Unit	Tex.	Wond	7/80	410	10	2	Sub-Clarksville	S	21.4	471
Mitchell Energy	Alba SEFB Unit	Tex.	Wood	2/72	731	13	4	Sub-Clarksville	S	23.3	525
Mitchell Energy	Jacksboro S.	Tex.	Jack	5/82	270	7	8	Strawn	S	19.9	86.0
Mitchell Energy	Lucy N.	Tex.	Borden	10/83	550	8	4	Pennsylvanian	LS	9.7	30

Depth, ft	Reservoir oil Gravity, °API	cp	°F.	Previous prod.	Residual saturation % Start	End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
9,000	40.0	0.25	241	Prim.	60.0	20.0	JS	1,000		Succ.	Yes	FW
6,000	24.0	2.20	158	WF	57.0	54.0	JS	48,000		Prom.	Yes	P (Exp. L)
12,000	46.0	0.20	185	HC gas cycling	98.5	52.0	HF	10,000	1,000	TETT		FW
1,200	28.0	5.00	85	Prim.	67.0		HF	80	50	TETT		FW
11,500	46.0	0.20	174	HC gas cycling	47.0		HF	3,800	2,550	TETT		FW
15,700	48.0	0.30	286	WF	59.0		JS	3,600	1,500	Prom.	Yes	
15,400	51.0	0.20	285	WF	59.0	46.0	JS	20,800	7,600	Prom.	Yes	
15,565	51.0	0.15	288	Prim.	76.0	—	JS			TETT	TETT	
10,000	38.0	0.30	190	Prim.	98.0	75.0	HF	2,300	2,300	Succ.	Yes	FW
8,835	44.0	0.60	132	Prim.	43.8	37.0	HF	4,420		Succ.	Yes	FW
18,500	54.0	0.18	325	Prim.	80.0	45.0	JS	9,200	4,050	Succ.	Yes	FW
8,600	46.0	0.30	130	Prim.			NC	8,000	6,400	Succ.	Yes	FW
4,530	24.0	3.70	168	Prim.			HF		15,000	Succ.	Yes	

Table G

Depth, ft	Reservoir oil Gravity, °API	cp	°F	Previous prod.	Residual saturation % Start	End	Project maturity	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
3,700	35.0	2.60	90	WF	63.0	60.0	HF	420		Prom.	Yes	
1,000	31.0	13.0	87	WF	37.0	35.5	HF	850		Succ.	Yes	FW
5,500	32.0	2.80	143	WF	39.0	26.0	NC	410		Prom.		FW
7,500	20.7	26.0	135	WF			NC	94		Prom.		P (Exp. UL)
2,750	20.0	39.0	135	WF			HF	900		Prom.	Yes	FW
8,700	21.0	12.0	197	WF			HF	200		Prom.		P
8,700	22.0	24.0	170	WF			HF	150		Prom.		P
3,500	31.0	20.0	95	WF			JS	2,400	1,200	Prom.	Yes	FW
7,900	20.2	29.7		Prim.	74.4	33.3	JS			TETT		FW
7,400	36.0	1.40	160	WF	45.0	21.0	NC	400	200	Succ.	Yes	FW
7,100	30.0	2.40	165	Prim.	65.0		HF				No	
7,100	41.0	2.30	120	WF	36.0	32.0	HF			TETT	TETT	
2,900	36.0	2.36	107	WF	51.0		NC	280	80	Succ.		FW
2,900	32.0	2.50	165	Prim.	54.0		HF	90	15	NE		FW
3,500	36.0	5.00	107	WF	39.0		NC	240		Succ.	Yes	FW
3,350	32.0	3.50	95	WF	64.0		NC	250		Succ.	Yes	FW
5,600	32.0	3.50	100	WF	49.0		NC	1,310	390	Succ.	Yes	FW
2,800	32.0	2.70	88	WF	58.0		HF	5,000		Succ.	Yes	FW
2,600	33.0	1.50	95	WF	42.0		NC	5,700		Succ.	Yes	FW
4,500	37.0	1.30	101	Prim./WF			HF	791		Succ.	Yes	FW
3,600	41.5	1.20	100	Prim.	38.1	27.0	HF	175	11	Succ.	Yes	FW
3,550	44.0	1.20	100	Prim.	43.6	23.9	NC	50	2	Succ.	Yes	FW
3,050	42.0	1.40	90	WF	40.0	36.7	NC	30	1	Succ.	Yes	FW
3,200	41.8	1.45	95	WF	43.8	29.1	NC	180	9	Succ.	Yes	FW
3,300	43.0	0.95	95	Prim.	42.0	25.4	NC	220	11	Succ.	Yes	FW
1,800	44.0	2.33	85	Prim.	37.5	27.3	NC	200	12	Succ.	Yes	FW
1,800	36.0	6.00	75	WF			JS			TETT	TETT	
1,950	28.0	17.0	78	WF			JS			TETT	TETT	
3,100	36.0	10.0	87	WF			JS			TETT	TETT	
3,000	32.0	10.0	83	WF			JS			TETT	TETT	
3,215	38.0	1.40	97	WF			JS			TETT	TETT	
4,950	20.0	20.0	150	WF	84.0	75.0	NC			Succ.	Yes	
7,530	39.0	1.50	142	WF			JS			TETT	TETT	
2,400	35.0	8.70	96	WF	43.0		HF			Prom.	Yes	
4,900			170	Prim.			JS			TETT	TETT	
5,900	29.0	1.30	165	WF			JS			TETT	TETT	
2,900	36.0	2.50	90	WF	40.0		NC	680		NE	Yes	
3,000	26.0	9.10	90	WF	50.0		NC	1,700		NE	Yes	
4,500	35.0	1.90		WF	57.0	53.0	HF	1,250		Prom.	Yes	FW
8,000	20.0	20.0	124	Prim.	65.0	37.7	HF	170	120	Succ.	Yes	FW
4,500	39.0			Prim./WF	50.0	40.0	NC	900	550	Succ.	Yes	FW
3,500	37.0	1.90	142	Prim.	57.0	33.0	NC	530	355	Succ.	Yes	LW
1,100	30.0	18.0	70	Prim.	51.0		NC	20	20	Disc.	No	P (Exp. UL)
1,500	30.0	5.50	82	Prim.			HF	15,567		Succ.	Yes	FW
5,600	23.0	17.0	121	Prim./WF			NC	3,200	413	Succ.	Yes	FW
4300/4500	24.0/24.0	15/15	105/110	Prim./WF			HF	2,050	1,000	Succ.	Yes	FW
4,240	22.1	20.0	140	Prim./WF			JS	1,538	365	Prom.	Yes	FW
3370/3520	22.5/22.1	8.2/10.0	108/110	Prim./WF	45.0		HF	12,500	2,600	Succ.	Yes	FW
3600/3840	21.0/21.0	15.7/15.7	105/180	Prim./WF	54.0	39.0	NC	10,400	3,000	Succ.	Yes	FW
4,100	15.1	75.0	150	WF	62.6	58.7	NC	54	54	Disc.		FW
4,200	15.5	75.0	150	Prim.	69.5	60.7	NC	63	63	Succ.	Yes	FW
1,975	40.0	1.73	100	Prim.	50.0	22.0	NC	209	209	Succ.	Yes	FW
7,640	40.0	0.44	140	Prim.	52.6	35.7	HF	185	30	TETT	TETT	FW

Producing chemical EOR projects in U.S. — continued

Operator	Field	State	County	Start date	Area, acres	— Number wells —		Pay zone	Formation type	Porosity, %	Permeability, md
						Prod.	Inj.				
Mobil	Vacuum	N.M.	Lea	5/84	320	10	4	San Andres	Dolo.	10.4	3-100
Mobil	Cement	Okla.	Caddo	11/81	1,510	96	23	Fortuna/Noble-Olson	S	19.2	18
Mobil	Cement	Okla.	Caddo	9/81	1,120	71	23	Fortuna/Noble-Olson	S	36.1	74
Mobil	Cushing	Okla.	Creek	5/84	120	4	2	Bartlesville	S	19.0	290
Mobil	Fitts	Okla.	Pontotoc	7/82	1,520	148	87	Cromwell 60	S/LS	10-25.0	6-60
Mobil	Golden Trend	Okla.	Garvin/Grady	10/85	800	14	4	Springer	S	12.5	58
Mobil	Healdton	Okla.	Jefferson/ Carter	7/81	1,045	151	41	Healdton	S	24.2	386
Mobil	Postle, Hough, Morrow 'A' Unit	Okla.	Texas	7/82	3,360	24	15	Morrow	S	15.8	45
Mobil	Postle, Hovey, Morrow Unit	Okla.	Texas	9/82	7,881	34	17	Morrow	S	16.8	45
Mobil	Postle, Postle Upper Morrow Unit	Okla.	Texas	11/82	3,944	29	19	Morrow	S	15.4	45
Mobil	Postle, West Hough, Morrow Unit	Okla.	Texas	4/83	7,601	39	24	Morrow	S	15.7	45
Mobil	Sho-Vel-Tum	Okla.	Carter	7/82	780	35	29	Deese	S	18.8	95.3
Mobil	Sho-Vel-Tum	Okla.	Carter	10/82	450	21	14	Deese	S	17.0	45-860
Mobil	Sho-Vel-Tum	Okla.	Stephens	11/82	1,980	100	43	Deese	S	17.4	44.8
Mobil	Sho-Vel-Tum	Okla.	Carter	8/82	451	30	6	Deese	S	20.0	192
Mobil	Sho-Vel-Tum	Okla.	Stephens	8/82	350	20	11	Deese	S	16.0	4.5-123
Mobil	Sho-Vel-Tum	Okla.	Carter	7/82	2,750	136	56	Tatums Stray Pennington	S	22.3	787
Mobil	Sho-Vel-Tum	Okla.	Stephens	8/82	1,360	71	52	Deesn Springer	S	18.1	66
Mobil	Sho-Vel-Tum	Okla.	Carter	7/82	1,700	109	53	Deese	S	17.2	100
Mobil	Salt Creek	Tex.	Kent	12/84	12,100	176	85	Canyon Reef	LS	12.0	20
Natl. Coop. Refinery Assn.	Stewart Ranch	Wyo.	Campbell	2/72	1,200	14	14	Minnelusa	S	16.5	92
Oxy USA	Harmony Hill	Kan.	Rooks	10/84	130	5	3	Lansing/Kansas City	LS	12.5	
Oxy USA	Hoof	Kan.	Graham	6/82	960	18	8	Lansing/Kansas City	LS	12.0	74-113
Phillips	South Cowden	Tex.	Ector	9/83	2,050	54	23	Grayburg	Dolo.	11.9	3.7
Phillips	Vacuum	N.M.	Lea	8/83	320	14	8	San Andres	Dolo.	11.5	17
Phillips	North Burbank	Okla.	Osage	9/80	1,440	64	36	Burbank	S	15.5	50
Santa Fe Energy	Candy Draw	Wyo.	Campbell	5/87	482	9	1	Minnelusa	S	16.0	
Shell	Big Mineral Creek-Barnes Sand Unit	Tex.	Grayson	12/84	1,065	14	18	Barnes Sand	S	18.5	59
Shell	Big Mineral Creek-S Sand Unit	Tex.	Grayson	5/85	1,600	22	14	S Sand	S	13.0	28
Sun	Fitts	Okla.	Pontotoc	1982	3,030	88	102	Viola	LS	13.6	1-36
Sun	Hitts Lake	Tex.	Smith	10/80		22	8	Paluxy	S	18.9	300
Sun	Stephens County Regular	Tex.	Stephens	2/80	3,900	67	62	Caddo	LS	14.2	11
Sun	Stephens County Regular	Tex.	Stephens	2/80	700	11	12	Caddo	LS	14.2	11
Sun E&P	Stephens County Regular	Tex.	Stephens	3/86	3,026	63	75	Caddo	LS	14.0	10
Tesoro Petroleum	Hospah Sand Unit	N.M.	McKinley	1/83	1,061	31	16	Upper Hospah	S	24.7	467
Tesoro Petroleum	S. Hospah Lower Sand Oil Pool	N.M.	McKinley	10/83	594.6	50	13	Lower Hospah	S	27.3	1,282
Tesoro Petroleum	Elaine (San Miguel)	Tex.	Dimmit	12/81	1,260	11	13	San Miguel	S	21.7	6
Texaco	Vacuum Grayburg-San Andres	N.M.	Lea	7/82	1,486	37	29	Grayburg/San Andres	Dolo.	11.0	18
Texaco	Carthage N.E.	Okla.	Texas	4/83	1,024	7	4	Morrow 'A'	S	18.6	92
Texaco	Hewitt	Okla.	Carter	4/84	220	8	5	Hoxbar	S	21.0	84
Texaco	Hewitt	Okla.	Carter	8/82	300	6	5	Hoxbar	S	19.0	270
Texaco	Hewitt	Okla.	Carter	11/85	100	6	3	Lone Grove	S	18.0	50
Texaco	Naval Reserve	Okla.	Osage	2/82	3,360	90	28	Bartlesville	S	15.8	12
Texaco	Sho-Vel-Tum	Okla.	Carter	2/83	225	14	5	Deese	S	17.0	59
Texaco	Sho-Vel-Tum	Okla.	Carter	1/83	1,390	73	34	Hoxbar Deese	S	20.3	200
Texaco	Sho-Vel-Tum	Okla.	Carter	5/85	570	32	22	Deese	S	17.0	70
Texaco	Sho-Vel-Tum	Okla.	Stephens	8/81	190	7	4	Deese	S	17.4	216
Texaco	Black Diamond	Tex.	Jim Hogg	4/83	200	4	3	Pettus II	S	25.0	212
Texaco	Slaughter	Tex.	Cochran	12/81	7,406	275	90	San Andres	Dolo.	10.7	3
Texaco	Slaughter	Tex.	Cochran	2/84	1,887	33	15	San Andres	Dolo.	11.2	6.02
Toco Corp.	Clareton	Wyo.	Weston	10/85	200	6	1	Newcastle	S	15-18.0	1-15
Toco Corp.	Mush Creek	Wyo.	Weston	1969	900	8	6	Newcastle	S	15-18.0	1-15
Unocal	Dos Cuadras	Calif.	Santa Barbara	6/83	320	37	10	EP/FP	S	27-31.0	260-680
Unocal	Healdton	Okla.	Carter	12/82	2,010	162	105	Healdton Sands	S	26.2	346
Unocal	Osage-Hominy	Okla.	Osage	4/83	2,880	97	6	Miss. Chat	Chert. LS	30.0	27
Unocal	Farnsworth	Tex.	Ochiltree	9/83	13,005	35	40	Morrow	S	14.5	21.8
Unocal	Howard Glasscock	Tex.	Howard	1/83	169	12	11	Queen	S	22.0	37
Unocal	Southwest Van Unit	Tex.	Van Zandt	9/84	529	24	29	Lewisville	S	26.0	100
Micellar-polymer											
Chevron	Berry Hill (Kiefer)	Okla.	Creek	9/82	82	12	21	Glenn	S	20.0	150
Gary	S. Johnson	Ill.	Clark	6/81	49	36	22	Partlow	S	18.3	302
Marathon Oil	Lawrence Robins 102 B Maraflood	Ill.	Lawrence	8/82	25	12	5	Bridgeport	S	21.0	398
Marathon Oil	Lawrence-Robins 202-B Project	Ill.	Lawrence	10/85	1.25	4	1	Bridgeport Main	S	20.6	352
Marathon Oil	Main Consolidated M-1 Project	Ill.	Crawford	2/77	407	56	60	Robinson	S	19.0	102
Marathon Oil	Main Consolidated M-2 Project	Ill.	Crawford	7/80	331	72	53	Robinson	S	19.0	150
Oxy USA	Madison	Kan.	Greenwood	8/82	40	15	16	Bartlesville	S	18.9	42
Texaco	Salem Consolidated	Ill.	Marion	8/81	60	20	12	Benoist	S	15.4	154
Texaco	Sho-Vel-Tum	Okla.	Stephens	8/83	8.75	3	3	Sims		17.0	83
Alkaline											
Conoco	San Miguelito	Calif.	Ventura	11/82	316	16	11	Third Grubb	S	15.1	36
Unocal	South Van Unit	Tex.	Van Zandt	9/80	800	6	12	Lewisville	S	26.0	100
Unocal	Carroll Unit	Tex.	Van Zandt	11/81	212	3	7	Lewisville	S	26.0	100
Shell Offshore	White Castle	La.	Iberville	9/87	1	2	1	Q RA SU	S	31.0	1,000

Depth, ft	Reservoir oil			Previous prod.	Residual saturation %		Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
	Gravity, °API	cp	°F.		Start	End						
4,700	37.0	1.02	101	Prim./WF	33.0	30.0	HF	300		TETT	Yes	P (Exp. UL)
2,000-3,200	35.0	5.00	95	WF	52.0		HF	350	60	Succ.	Yes	FW
2,400-3,325	35.0	6.00	95	WF	57.0		HF	615	70	Succ.	Yes	FW
2,700	39.0	4.00	94	WF	31.0		JS	125	35	Succ.	Yes	FW
2,500-4,000	40.0	4.00	115	WF	57.0		HF	2,775	740	Succ.	Yes	FW
9,400	38.0	3.00	160	WF	49.0		JS	250	30	Succ.	Yes	P (Exp. L)
1,000	32.0	10.0	84.2	WF	46.2		HF	708	100	Succ.	Yes	FW
6,200	41.0	1.03	147	WF	39.0	37.0	NC	624	180	Succ.	Yes	FW
6,200	41.0	1.03	146	WF	45.0	44.0	NC	500	20	Succ.	Yes	FW
6,100	40.0	1.03	147	WF	40.0	38.0	NC	260	100	Succ.	Yes	FW
6,500	40.0	1.03	145	WF	43.0	41.0	NC	740	120	Succ.	Yes	FW
3,500	30.0	15.7	112	WF	47.9		HF	413	30	Succ.	Yes	FW
3,500	28.0	20.0	80	WF	49.0		HF	153	20	Succ.	Yes	FW
4,900	26.0	13.6	120	WF	47.0		HF	580	10	Disc.	No	FW
3,900	34.0	10.5	89	WF	53.0		HF	570	313	Succ.	Yes	FW
4,000	31.0	5.60	105	WF	36.0		HF	40	5	Disc.	No	FW
2,750	25.0	68.0	83	WF	48.0		HF	1,847	380	Succ.	Yes	FW
4,400	30.0	16.0	117	WF	55.0		HF	1,052	170	Succ.	Yes	FW
3,350	30-38.0	3-5-10	102	WF	52.4		HF	1,330	100	Succ.	Yes	FW
6,300	39.2	0.85	129	WF	60.0	58.0	NC	27,699	2,800	Succ.	Yes	FW
8,100	20.0	25.0	136	WF	68.0	49.0	NC	1,013	1,013	Succ.	Yes	FW
3,130	38.6	3.70	105	Prim.	49.0	34.0	JS	65	65	Succ.	Yes	FW
3,700	41.0	2.30	120	WF	36.0		JS	62	62	TETT	NE	FW
4,750	35.0	3.40	96	WF	67.0	59.0	NC	1,000		Disc.	No	FW
4,500	37.0	1.20	101	Prim.	74.9	58.2	NC	1,400		Succ.	Yes	FW
2,900	39.0	3.00	120	WF	53.0	47.0	NC	575	355	Succ.	Yes	FW
7,300	26.0			Prim.			JS	1,300	1,300	Prom.		
5,000	37.0	1.50	120	WF	50.0	47.0	JS	300	0	Disc.	No	P (Exp. UL)
5,200	37.9	1.67	124	WF	44.0	37.0	JS	570	0	Disc.	No	FW
	39.0	3.20	119	WF			HF	2,469		Succ.	Yes	FW
7,250	26.0	2.71	210	WF			HF	1,135		Succ.	Yes	FW
3,300	39.0	1.80	131	WF			HF	2,366		Succ.	Yes	FW
3,300	39.0	1.80	131	WF			HF	174		Succ.	Yes	FW
3,200	39.0	3.00	130	WF			HF	1,430		Prom.		FW
1,600	30.0	13.0	95	WF	69.0	66.2	JS	163	23	Succ.	Yes	FW
1,600	24.0	35.0	95	WF	82.5	55.9	JS	483	25	Succ.	Yes	FW
4,450	36.0	3.00	140		80.2	67.0	HF	117	82	Succ.	Yes	FW
4,720	38.0	1.47	105	WF	45.0	44.0	NC	3,650	0	Succ.	Yes	FW
4,400	40.0	2.00	113	WF	45.0	44.5	C	209	60	Succ.	Yes	FW
2,400	33.0	10.0	94	WF	39.0	37.0	C	102	46	Succ.	Yes	FW
2,350	35.0	6.00	98	WF	40.0	39.8	C	41	10	Succ.	Yes	FW
4,000	30.0	4.30	115	WF	39.0	37.0	C	135	31	Succ.	Yes	FW
2,650	38.0	3.50	90	WF	27.2	26.7	C	463	15	Succ.	Yes	FW
4,400	20-34.0	4.30	102	WF	38.0	37.2	C	94	8	Disc.	Yes	FW
3,100	25.0	20.0	95	WF	49.0	47.8	C	1,520	200	Succ.	Yes	FW
3,500	34.0	10.0	110	Prim.	57.0	55.0	NC	1,059	320	Succ.	Yes	FW
5,500	22.0	60.0	124	Prim.	64.0	56.0	C	88	29	Succ.	Yes	FW
4,550	48.0	0.40	164	Prim.	68.0	41.0	C	202	178	Succ.	Yes	FW
5,000	31.0	1.47	107	WF	49.4	45.6	C	6,150	900	Succ.	Yes	FW
5,000	31.0	1.47	110	WF	53.0	50.0	NC	291	0	Disc.	Yes	FW
6,000	40.0		160	Prim.			JS	5	5	TETT	TETT	P (Exp. UL)
4,400	40.0		115	Prim.			NC	90	90	Succ.	Yes	FW
1,280-1,650	25-26.0	15-24	95-103	WF	54-59	44-47	JS	3,100	0	TETT	TETT	FW
800	33.0	10.0	80	WF	56.0	47.0	HF	1,270	80	Succ.	Yes	FW
2,880	39.0	3.00	100	WF	51.0	48.0	HF	1,090	55	Succ.	Yes	FW
7,400	38.0	1.00	141	WF	43.0	40.0	HF	190	10	Disc.	Yes	FW
1,600	32.0	10.0	90	WF	50.7	43.4	JS	76	32	Succ.	Yes	FW
2,800	35.0	2.30	130	WF			JS	762	5	Prom.	Yes	FW
1,300	39.0	4.40	100	WF	50.0		HF	1,000	990	Succ.		FW
475	30.0	20.0	65	WF	46.0	28.0	HF	60	40	TETT	No	
950	29.0	18.0	70	Prim./WF	45.0		HF	250	250	TETT	TETT	P (Exp. UL)
900	29.0	18.0	70	WF	45.0		HF	20	20	TETT	TETT	P (Exp. UL)
1,000	36.0	6.00	70	Prim./WF	40.0		NC	100	100	Prom.	No	FW
1,000	35.0	7.00	70	Prim./WF	40.0		JS	50	50	TETT	TETT	FW
1,900	38.0	2.90	97	Prim.	34.0		NC			NE	No	P (Exp. UL)
1,750	36.0	36.0	72	WF	30.5	15.3	C	110	110	Prom.	No	P (Exp. UL)
7,000	28.0	12.0	135	WF	50.0	45.0	C	30	30	Disc.	No	P (Exp. UL)
8,011	31.0	0.70	205	Prim./WF	70.0	55.0	JS	950			TETT	FW
2,600	35.0	2.30	130	WF			NC	88	0	Disc.	Yes	FW
2,600	33.0	2.30	130	WF			NC	9	0	Disc.	Yes	FW
5,600-5,800	25.0	3.00		Aquifer influx	22.0	16.0	HF			TETT		P

Completed, terminated U.S. projects*

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Alkaline											
Chevron	Quarantine Bay	La.	Plaquemines	11/81	200	5	3	3 (RB)SU	S	27.0	50-2,000
Chevron	Whittier	Calif.	Los Angeles	2/83	373	25		2nd & 3rd Zones	S	28.0	350
Mobil	Torrance	Calif.	Los Angeles	6/81	604	45	21	Main	S	31.0	220
Biopolymer											
Apache	Dry Creek	Neb.	Hitchock	7/85	500	9	5	Lansing/Kansas City	LS	13.0	13
CO_2 immiscible											
Phillips	Lick Creek	Ark.	Bradley-Union	1/76	1,640	39	13	Meakin	S	30.3	1,200
Texaco	Bayou Sale	La.	St. Mary	5/84	564	5	2	St. Mary	S	31.0	500
Texaco	West Delta Block 109	La.	Offshore	6/85	75	1	1	13100-Foot	S	29.7	68
Texaco	West Delta Block 109	La.	Offshore	6/85	74	1	1	10800-Foot	S	30.0	1,900
Texaco	Magnet Withers Pierce Estates B&C	Tex.	Wharton	7/83	500	4	0		S	23.0	1,700
Texaco	Pickett Ridge	Tex.	Wharton	5/83	726	4	0	Pickett Ridge	S	30.0	1,200
Texaco	Thompson	Tex.	Fort Bend	1/83	100	2	0	Frio	S	27.0	100-1,000
Texaco	Paradis	La.	St. Charles	3/84	110	2	2	Main Pay	S	28.0	1,033
Texaco	Manvel	Tex.	Brazoria	11/83	128	1	0	Oligocene	S	30.0	1,000
Texaco	Cole Blanche Bay West	La.	St. Mary	3/84	55	3	3	14 Sand	S	29.0	322
Texaco	West Delta Block 109	La.	Offshore	6/85	48	1	1	10200-Foot	S	27.0	205
Texaco	South Marsh Island Block 6	La.	Offshore	6/85	82	2	1	Rob E-S	S	29.6	323
Texaco	Lake Barre	La.	Terrebonne	3/84	1,164	12	4	Upper M	S	25.0	139
Texaco	Manvel	Tex.	Brazoria	10/82	43	1	0	Oakville	S	30.0	400
Texaco	Lafitte	La.	Jefferson	8/84	271	5	2	8900-Foot	S	27.0	250
Texaco	Pierce Ranch	Tex.	Wharton	1/83	480	8	0	Pierce Ranch	S	31.8	534
Texaco	West Columbia	Tex.	Brazoria	6/83	33	3	0	PTSD	S	30.0	560
Texaco	Magnet Withers BH&S State Tracts	Tex.	Wharton	10/83	1,224	1	0	Magnet Withers	S	23.0	1,700
	J.E. Broussard A.C. Thompson										
Texaco	Withers North	Tex.	Wharton	3/83	454	10	0	Withers N.	S	25.0	1,050
Texaco	West Delta Block 109	La.	Offshore	6/85	78	1	1	12500-Foot	S	27.0	1,032
CO_2 miscible											
ARCO	Garber	Okla.	Garfield	10/81	80	9	4	Crews	S	19.0	12
Chevron	University Waddell	Tex.	Crane	5/83	920	49	13	Devonian	Dolo.	12.0	14
Citronelle Unit	Citronelle	Ala.	Mobile	5/81	13,640	42	10	Rodessa	S	15.0	13
Grace Petroleum	South Bishop Ranch	Wyo.	Campbell	1/82	640	5	2	Minnelusa	S	16.0	50
Grace Petroleum	South Bishop Ranch	Wyo.	Campbell	1/82	1,280	5	4	Minnelusa	S	15.0	150
Carbonated waterflood											
Amoco	San Andres	Calif.	Fullerton	10/85	1,600	40	32	San Andres	Dolo./ LS	13.0	1.4
Combustion											
Bayou State	Caddo Pine Island	La.	Caddo	1979	20	13	3	Nacatoch	S	30.0	500
Lawrence-Allison	Teapot Dome NPR-3	Wyo.	Natrona	9/80	10	9	8	Shannon	S	18.0	63
Marathon Oil	Main Consolidated	Ill.	Crawford	10/61	517	51	5	Robinson	S	19.7	320
Mobil	South Belridge	Calif.	Kern	1964	245	24	0	Tulare	S	35.0	3,000
Texaco	Camp Hill	Tex.	Anderson	9/85	17.4	29	6	Carrizo	S	38.0	4,000
Unocal	Brea-Olinda	Calif.	Orange	3/72	17.1	12	2	1st Miocene	S	29.0	300
Hydrocarbon miscible											
Amoco	Slaughter	Tex.	Hockley	4/72	12.2	2	6	San Andres	Dolo.	10.5	4.3
Chevron	Swanson River	Alaska		11/83	2,660	33	8	Hemlock	Congl.	21.0	143
Exxon	Means	Tex.	Andrews	11/83	8,700	438	184	San Andres	Dolo.	9.0	20
Mitchell Energy	Alvord (3,000 ft Strawn)	Tex.	Wise	7/80	217	6	3	Bryson	S	20.0	46
Micellar-polymer											
Amoco	Torchlight	Wyo.	Big Horn	1981	6.4	1	4	Tensleep	S	14.2	61
Gary	Bell Creek Unit 'A'	Mont.	Powder River	2/81	179	2	0	Muddy	S	24.9	1,218
Marathon Oil	Main Consolidated 219-R Project	Ill.	Crawford	10/75	113	2	0	Robinson	S	20.8	105
Marathon Oil	Main Consolidated 119-R Project	Ill.	Crawford	9/68	40	27	18	Robinson	S	20.0	200
Mitchell Energy	Wizard Wells	Tex.		1981	700	11		Caddo	S	14.0	50
Mobley O.B.	Lewisville	Ark.	Lafayette	7/80	458	8	3	Smackover	LS	21.8	24
Pennzoil	Bradford	Pa.	McKean	7/82	220	132	57	Bradford 3rd	S	21.0	188
Phillips	N. Burbank	Okla.	Osage	1975	90	16	9	Burbank	S	15.5	50
Texaco	Main Consolidated	Ill.	Crawford	12/81	10.88	9	0	Robinson		21.8	100
Unocal	East Coalinga Extension	Calif.	Fresno	12/80	90	18	4	Gatchell	S	14.2	150
Nitrogen											
Texaco	Vealmoor East	Tex.	Borden/ Howard	12/81	3,353	34	8	Canyon	LS	9.5	38
Polymer											
ARCO	Camrick District	Okla.	Beaver	9/84	2,980	12	10	Upper Morrow	S	15.0	14
ARCO	Horseshoe Gallup	N.M.	San Juan	11/83	450	10	8	Gallup	S	15.0	14
ARCO	Roehrs	Wyo.	Campbell	9/84	324	1	1	Minnelusa	S	17.0	92
ARCO	East Texas (Kinney Strickland Leases)	Tex.	Gregg & Rusk	3/85	380	59	14		S	25.0	2,000
Conoco	South Elk Basin	Wyo.	Park	11/84	540	6	1	Ember/Tensleep	S	15.1	90
Conoco	Frannie	Wyo.	Park	9/85	2,020	64	50	Phosphoria/Tensleep	S	13.6	130
Grace Petroleum	High Five	Mont.	Roseland	7/81	800	9	2	Stensvad	S	18.0	200
Lawrence-Allison	Teapot Dome NPR-3	Wyo.	Natrona	10/82				Shannon	S	18.0	63
Mobil	Sho-Vel-Tum	Okla.	Stephens/ Carter	12/82	1,285	32	8	Springer	S	15.4	17.9
Oxy USA	Beverly Hills/West Pico	Calif.	Los Angeles	12/84				Repetto/Main	S	26.6-28.0	77-193
Phillips	Lick Creek	Ark.	Bradley-Union	9/84	1,640	39	23	Meakin	S	30.3	1,200

Depth, ft	Reservoir oil			Previous prod.	Residual saturation %		Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
	Gravity, °API	cp	°F.		Start	End						
8,200	33.0	5.00	182	Prim.	51.0					Disc.	No	
2,300	20.0	30.0	120	WF	27.0	22.0		175	175	Disc.	No	
3,500	21.0	17	165	WF	40.7	39.6	Term. 1986	2,450		Disc.	No	
4,100	31.0	9	120	Prim.			Term.			None	No	P
2,500	17.0	160	118	Prim.	55.0	46.0	Term.	450	400	Succ.	Yes	FW
10,000	34.0	0.4	194	Prim.	50.0	45.0	Term.	1,500	0	Succ.	Yes	RW
11,325	37.0	0.3	210	Prim.	50.0	45.0	Term.	1,600	0	Disc.	Yes	RW
10,500	36.5	0.28	200	Prim.	50.0	45.0	Term.	400	0	Succ.	Yes	RW
5,500	26.0	2.3	154	Gas inj.	35.0	34.0	Term.	193	0	Disc.	Yes	FW
4,600	25.0	2.5	138	Prim.	29.0	28.0	Term.	93	0	Disc.	Yes	FW
5,100	25.2	2.7	120	Prim.	42-65		Term.	66	0	Disc.	Yes	FW
10,200	38.0	0.5	195	WF	50.0	45.0	Term.	350	0	Succ.	Yes	RW
5,000	26.7	7.2	149	Prim.	45.0	20.0	Term.	598	0	Disc.	Yes	FW
8,000	32.0	1.3	184	WF	50.0	45.0	Term.	100	0	Succ.	Yes	RW
10,000	37.3	0.26	194	Prim.	50.0	45.0	Term.	675	0	Disc.	Yes	RW
11,200	34.0	0.3	208	Prim.	50.0	45.0	Term.	250	0	Succ.	Yes	RW
13,000	33.0	0.4	236	WF	50.0	45.0	Term.	760	0	Succ.	Yes	RW
4,000	25.0	4.4	149	Prim.	42-65		Term.	122	0	Disc.	Yes	FW
8,900	34.0	0.7	185	Prim.	50.0	45.0	Term.	370	0	Succ.	Yes	RW
4,900	24.4	4.57	155	Prim.	48.0	18.0	Term.	404	0	Disc.	Yes	FW
2,600	30.0	8	116	Prim.	36-48	10-20	Term.	198	0	Disc.	Yes	FW
5,500	26.0	2.3	154	Gas inj.	35.0	31.0	Term.	37	0	Disc.	Yes	FW
5,250	25.7	2.45	145	Prim.	35.0	32.0	Term.	298	0	Disc.	Yes	FW
12,000	34.1	0.25	218	Prim.	50.0	45.0	Term.	2,300	0	Disc.	Yes	RW
1,900	44.0	1	100	WF	30.0	16.0	Term.	35		Succ.	Yes	
8,500	43.0	0.45	140	WF	38.0		Term.	1,750	0	Disc.	No	FW
10,600	42-45.0	0.46		Prim./WF	63.0		PP 2/83	3,519	357	TETT		P
9,200	35.0	1.14	220	WF								
9,400	34.0		180	WF								
4,500	32.0		100					1,300		TETT	TETT	FW
1,050	21.0	620	80	Prim.	96.0	48.0	Term. 5/86	100	84	Prom.	No	
270-425	33.0	10	65	Prim.	50.0	0.0	Term. 4/86	35	15	Succ.		P (Exp. UL)
900	29.0	35	65	Prim./WF	55.0	40.0	Term. 11/86	80	80	Prom.	Yes	
1,000	14.0	1,600	95	Prim.	64.0	35.0	Term. 3/86	210	140	Succ.	Yes	FW
500	18.0	1,200	75	Prim.	59.0	25.0	Term.	29	0	Disc.	No	P (Exp. UL)
2,200	16.0	90	109	Prim.			Term.	150	50	Disc.	Yes	P (Exp. UL)
5,000	28.0	1.9	105	WF	58.0		Term.	0	0	Succ.		P (Exp. UL)
10,300	37.0	1	180	HC immisc.	33.0	30.0	Term. 1986	5,383		NE		FW
4,300	29.0	6	97	WF						TETT	TETT	
[illegible],000	41.0	0.95	107	WF	37.0	32.0	Term.	4	4	Disc.	No	
3,100	34.4	41.2	100	WF	36.0			5	2	TETT	No	P (Exp. UL)
4,500	32.0	7	110	WF	33.1	21.5	Term. 1/87	0	0	Succ.	Yes	
1,000	35.0	7	70	Prim./WF	40.0	27.1	Term 12/82	0	0	Disc.	No	P (Exp. UL)
1,000	35.0	7	70	Prim./WF	40.0	25.0	Term 12/76	0	0	Prom.	No	
4,900	42.0	1.2	130	Prim.	82.0	28.0		50	50	Succ.	Yes	
6,800	43.0	0.323	191	WF	87.0			421	8	NE	TETT	
1,900	45.0	5	68	Prim.	40.0	22.0	Term.	60	200	TETT		
2,900	39.0	3	120	WF	30.0	18.0	Term.	19		Prom.	Yes	P (Exp. UL)
1,040	31.0	16	85	WF	40.0	33.6	Term.	31	0	Disc.	No	P (Exp. UL)
7,500	31.4	2.2	200	Prim.	43.0	10.0	Term.	700	0	Disc.	No	P (Exp. UL)
7,350	43.0	1.2	155	WF	66.0	42.0	Term.	2,521	0	Disc.	Yes	FW
7,100	39.0	1.5	149	WF				290		TETT	TETT	
1,200	42.0	1.7	87	WF			Term.	500		Disc.	No	
7,465	25.0	9	177	WF				14	5	Succ.	Yes	
3,650	39.0	1	140	WF			Term.	1,197	350	Succ.	Yes	
7,100	29.0	6	140	Prim./WF			Term.	83	0	Disc.	No	FW
3,300	26.3	15	95	Prim./WF			Term.	3,593		Disc.	No	FW
5,600	40.0		140	Prim.				480		TETT	Yes	
550	33.0	10	65	Prim.	50.0	50.0	Term. 4/86	20	5	Disc.		P (Exp. UL)
5,200	39.0	2.4	110	WF	50.0		Term.	70		Prom.	Yes	
6,800	26-32.0	1	200	WF	37.5		Term. 12/86				TETT	FW
2,500	17.0	160	118	CO2	55.0	46.0	Term.	450	100	Succ.	Yes	FW

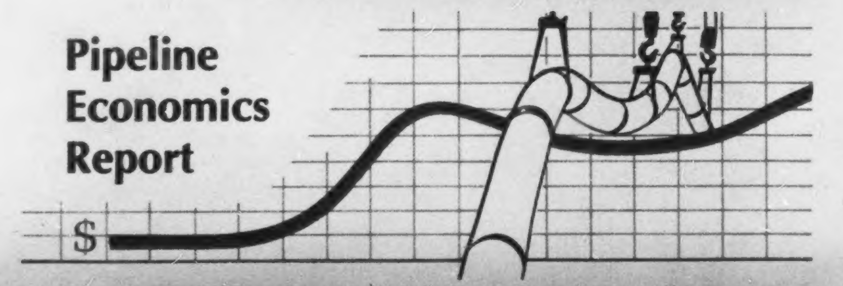
Completed, terminated U.S. projects* — continued

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Phillips	South Burbank	Okla.	Osage	7/82	720	34	23	Burbank	S	19.5	150
Phillips	Bates Unit	Kan.	Sumner	1/84	640	14	2	Mississippi	LS	15.5	19.7
Phillips	North Burbank	Okla.	Osage	3/83	1,440	58	23	Burbank	S	15.5	50
Phillips	Golden Trend	Okla.	Grady	10/83	720	4	4	Springer	S	9.7	58
Samedan	S. Robertson	Tex.	Gaines	1/81	1,600	56	11	Glorieta/Clfk.	Dolo.	7.9	0.5
Samedan	Kuehne Ranch Unit	Wyo.	Campbell	3/81	645	5	2	Minnelusa	S	14.4	52.8
Texaco	Cogdell	Tex.	Kent & Scurry	6/83	15,378	99	126	Canyon Reef Limestone	LS	9.6	5
Texaco	Loudon	Ill.	Fayette	12/84	800	18	13	Weiler	S	21.0	142
Texaco	Levelland	Tex.	Hockley	4/83	3,595	108	37	San Andres	Dolo.	10.0	0.6
Texaco	Robertson North	Tex.	Gaines	9/83	1,400	27	16	Glorieta	Dolo.	7.7	1.54
Texaco	Balko South	Okla.	Beaver City	8/82	1,320	7	3	Kansas City	LS	21.0	0-1,070
Texaco	Cowden North	Tex.	Ector/Andrews	12/84	2,440	52	61	Grayburg/San Andres	S/LS/ Dolo.	10.1	3.8
Texaco	Mabee	Tex.	Andrews/ Martin	12/81	13,500	213	230	San Andres	Dolo.	10.5	1.5
Texaco	Jordan	Tex.	Ector & Crane	1/84	1,513	62	30	San Andres	Dolo.	10.5	6
Texaco	Apache Pool	Okla.	Caddo	[illegible]	1,060	16	8	Bromide	S	13.6	350
Texaco	McElroy	Tex.	Crane/Upton	[illegible]	7,550	504	333	Grayburg/San Andres	Dolo.	11.0	5
Texaco	Glenn Pool	Okla.	Creek	[illegible]	480	16	8	Bartlesville	S	19.5	400
Texaco	Hewitt	Okla.	Carter	3/84	240	9	3	Hoxbar	S	21.0	100
Texaco	Penwell	Tex.	Ector	11/84	4,470	106	36	San Andres	Dolo.	7.8	2.2
Texaco	Ventura	Calif.	Ventura	3/83	800	95	56	C-Block	S	20.0	130
Texaco	Spraberry Deep	Tex.	Dawson	7/83	2,448	15	20	Upper Spraberry Sand	S	17.9	10.6
Texaco	Sho-Vel-Tum	Okla.	Stephens	4/85	3,740	121	20	Sims	S	19.1	190
Texaco	Sho-Vel-Tum	Okla.	Stephens	6/84	150	16	12	Permian	S	25.3	128
Texaco	Harris	Tex.	Gaines	10/83	3,800	83	80	Glorieta	Dolo.	8.6	3
Texaco	Hewitt	Okla.	Carter	7/84	1,200	29	11	Lone Grove	S	18.0	50
Texaco	Flowers	Tex.	Stonewall	8/83	5,876	112	67	Canyon	S	14.7	2
Texaco	Blue Buttes	N. Dak.	McKenzie	12/85	12,770	30	19	Madison	LS	9.6	22
Texaco	Salem	Ill.	Marion	7/82	8,800	330	229	Miss./Devonian	S	10.5-17.9	5-2,200
Texaco	Aneth Unit	Utah	San Juan	9/85	17,000	160	167	Paradox	LS	10.6	18.3
Texaco	Cushing	Okla.	Creek	12/83	480	14	10	Bartlesville	S	17.0	100
Texaco	Dale	Ill.	Hamilton	11/85	4,100	35	4	Aux Vases	S	14.5	68
Texaco	Vacuum Grayburg-San Andres	N.M.	Lea	4/83	3,046	77	81	Grayburg/San Andres	Dolo.	11.6	13
Texaco	Tonti	Ill.	Marion	10/84	285	10	11	Renoist Auxvases McClusky	LS	47.3	358
Texaco	Atlantic	Okla.	Osage	5/85	1,920	35	7	Mississippi Chat/ Burgess	S	25.0	25
Texaco	Langlie Mattix	N.M.	Lea	2/83	9,360	124	110	Queen/Seven Rivers	S	11.4	7.2
Texaco	Spraberry Deep	Tex.	Dawson	7/83	2,368	12	11	Spraberry Lwr. Sand	S	16.3	5.7
Texaco	Sumatra	Mont.	Rosebud	12/84	4,778	18	21	Tyler	S	15.3	48
Unocal	Dollarhide (Clearfork)	Tex.	Andrews	10/85	2,800	57	33	Clearfork	Dolo.	11.6	8.5
Unocal	South Cowden	Tex.	Ector	1/86	1,600	38		Grayburg	Dolo.	8.5	3.1
Unocal	Smyer	Tex.	Hockley	11/84	4,410	72	38	Clearfork	Dolo.	8.3	1-20
Unocal	Orcutt	Calif.	Santa Barbara	6/84	1,680	78	51	Pt. Sal	S	22.5	78
Unocal	North Riley	Tex.	Gaines	2/84	6,720	105	40	Clearfork	Dolo.	7.7	12
Steam											
Angus Petroleum	Blackwell's Corner	Calif.	Kern	1/84	340	25		Agua	S	37.0	475
Chevron	Lost Hills Sec. 32	Calif.	Kern	4/77	120	30	4	Etchegoin Main	S	40.0	62
Chevron	Kern Front	Calif.	Kern	2/80	36	18	9	Chanac	S	29.0	1,000
Chevron	Bradley Canyon	Calif.	Santa Barbara	4/82	40	16	8	Sisquoc	S	30.0	800
Chevron	McKittrick 21Z	Calif.	Kern	9/77	44	19	0	Tulare	S	34.0	1,700
DCR Petroleum	O'Connell Ranch Unit	N.M.	Guadalupe	8/81	1.2	5		O'Connell	S	20.5	250
DCR Petroleum	T-4 Ranch Unit	N.M.	Guadalupe	10/82	1.2	3	1	O'Connell	S	20.5	250
Drilling & Production	Midway-Sunset	Calif.	Kern	1965	[illegible]60	34	20	Monarch	S	22.0	300
Elf Aquitaine	Poso McVan	Calif.	Kern	1980	120	32	19	Etchegoin	S	30-40.0	5,000
Elf Aquitaine	Poso Creek	Calif.	Kern	1980	50	35	19	Etchegoin	S	35.0	1,000
Mobil	Kern Front	Calif.	Kern	10/82	21	10	4	Etchegoin	S	37.0	1,000
Santa Fe Energy	Brea Olinda	Calif.	Orange	10/85	3	4	1	Anaheim	S	27.0	1,000
Shell	Coalinga	Calif.	Fresno	8/84	240	85	12	Temblor Zone I	S		
Shell	Cat Canyon (East)	Calif.	Santa Barbara	8/85	35	7		Brooks Sand	S	30.0	1,400
Shell	Arroyo Grande	Calif.	San Luis Obispo	9/84	208			M2	S	31.0	300
Shell	Coalinga	Calif.	Fresno	1982	57	21	10	Temblor Zone II	S		
Tenneco	Poso Creek	Calif.	Kern	1968	154	14		Etchegoin	S	32.0	2,500
Texaco	South Belridge	Calif.	Kern	1985	20	25	16	Tulare	S	37.0	2,700
Texaco	Poso Creek	Calif.	Kern	3/83	69	26	15	Basal Etchegoin	S	31.0	1,945
Texaco	Cat Canyon	Calif.	Santa Barbara	4/82	80	20	12	S1B	S	35.0	4,500
Texaco	Sour Lake	Tex.	Hardin	4/82	1.5	5	2	Miocene OB-1	S	32.0	1,500
Texaco	Cat Canyon (East)	Calif.	Santa Barbara	11/77	30	18	3	S16B Thomas Sand	S	31.5	404-1,749
Texaco	Sour Lake	Tex.	Hardin	4/80	2,645	1		Miocene	S	25-36.0	1,600
Texaco	Cat Canyon	Calif.	Santa Barbara	1965	300	12		S8-516	S	30.0	2,000
Unocal	Santa Maria Valley	Calif.	Santa Barbara	3/81	260	18	0	Pt. Sal	S	27.0	100
Unocal	Guadalupe	Calif.	San Luis	3/81	644	82	12	Sisquoc	S	35.0	1,550
Unocal	McKittrick	Calif.	Kern	12/82	70	25	14	Amnicola	S	37.0	1,500
Unocal	Belridge	Calif.	Kern	10/64	50	6	0	Tulare	S	37.0	2,500
Unocal	North Belridge	Calif.	Kern	8/64	35	6	0	Tulare	S	37.0	2,500
Unocal	Midway-Sunset	Calif.	Kern	1969	80	2		Tulare	S	26.0	300
Unocal	Jesus Maria	Calif.	Santa Barbara	8/82	20	2	0	Monterey	Fract Chert-Dolo	7.5	2
Unocal	McKittrick	Calif.	Kern	8/71	70	27	0	Tulare	S	37.0	1000-2000

* Data on acreage, wells and production are the most recent reported. They do not necessarily reflect the project's status at termination. † PP = Postponed

	Reservoir oil				Residual saturation %							
Depth, ft	Gravity, °API	cp	°F.	Previous prod.	Start	End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
2,750	39.0	3	120	WF	41.0	37.0	Term.	175		Disc.	No	FW
3,700	42.0	0.6	117	WF	50.0	48.0	Term.	200		TETT	TETT	FW
2,900	39.0	3	120	WF	48.0	44.0	Term.	80		Prom.	Yes	FW
9,800	38.0	2.9	155	WF	54.0	53.0	Term.	60		TETT	TETT	FW
5,800	34.0	1	107	WF	64.0	NA		2,080		Succ.	Yes	FW
7,900	26.0	8	134	Prim./WF				150	10	Succ.	Yes	FW
6,800	41.7	0.52	128	WF	28.0	26.0	C	5,022	0	Succ.	Yes	FW
1,550	37.0	5	88	WF	21.0	20.0	Term.	63	0	Disc.	No	FW
4,720	30.5	1.47	107	WF	45.0	44.0	C	2,017	0	Succ.	Yes	FW
5,809	30.8	0.67		WF	45.0	44.0	C	1,261	0	Succ.	Yes	FW
6,100	40.0	1.8	125	WF	40.0	38.3	C	65	0	Disc.	Yes	FW
4,450	34.0	1.63	94	WF	47.0	45.0	Term.	499	0	Disc.	Yes	P (Exp. UL)
4,700	32.0	2.38	106	WF	43.0	38.0	C	5,007	0	Disc.	Yes	FW
3,600	34.0	2.8	95	WF	54.0	53.0	C	677	0	Disc.	Yes	FW
3,900	39.0	3.2	96	WF	36.0	25.0	C	578	0	Disc.	Yes	FW
3,000	32.0	2.6	95	WF	59.0	33.0	C	6,624	0	Succ.	Yes	FW
1,500	37.0	6	90	WF	60.0	58.0	C	90	0	Disc.	No	FW
2,600	35.0	8	92	WF	45.0	44.0	C	66	0	Disc.	No	FW
3,600	33.0	1.8	95	WF	54.0	53.0	C	1,250	0	Disc.	Yes	FW
5,500	30.5	1.3	160	WF			Term. 2/86	6,300		TETT	TETT	
6,500	40.6	0.92	103	WF	37.0	34.0	C	231	0	Succ.	Yes	FW
4,000-7,000	24-29.0	5	105-135	WF	50.0	47.1	Term.	3,179	0	Disc.	No	P (Exp. UL)
1,100	28.0	50	90	WF	48.9	47.8	C	227	0	Disc.	Yes	FW
5,818	30.8	3.1		WF	45.0	44.0	C	5,912	0	Succ.	Yes	FW
4,500	35.0	4	115	WF	54.0	52.0	Term.	155	0	Disc.	No	P (Exp. UL)
4,200	42.0	1.9	130	WF	40.0	35.0	Term.	680	0	Disc.	Yes	P (Exp. UL)
9,400	42.0	0.3	240	WF	41.0	40.0	Term.	1,427	0	Disc.	No	P (Exp. UL)
1,700-3,600	40.0	3-4.4	82-104	WF	27.7	27.5	Term.	3,115	300	Succ.	Yes	FW
5,300	47.0	0.55	134	WF	52.0	46.0	Term.	5,823	0	Disc.	Yes	P (Exp. UL)
2,670	41.0	2.5	100	WF	57.0	54.0	C	103	0	Disc.	Yes	FW
2,500	36.0	4	100	WF	34.0	31.0	Term.	35	0	Disc.	No	P (Exp. UL)
4,720	38.0	1.47	105	WF	45.0	44.0	C	6,073	0	Succ.	Yes	FW
1,900-2,200	39.5	4	83	WF	30.9	28.5	Term.	78	0	Disc.	No	FW
2,500	39.0	4	95	WF	34.0	32.0	C	155	0	Disc.	No	FW
3,650	35.0	2.8	94	WF	50.7	46.2	C	1,088	0	Succ.	Yes	FW
7,100	39.3	0.885	130	WF	42.0	34.0	C	316	0	Succ.	Yes	FW
4,900	33.4	4.8	159	WF	29.8	28.7	Term.	463	0	Disc.	Yes	FW
6,500	37.0	0.56	110	WF	55.5	46.9	Term.	1,800	0	Disc.	No	P (Exp. UL)
4,500	34.0	3.5	103	Prim./WF	43.6	42.4	Can-celled	720		TETT	TETT	
5,900	27.0	5	112	WF	49.3	43.5	Term.	1,100	0	Disc.	No	FW
3,750	23.5	8	165	WF	46.0	40.0	Term.	1,640	0	Disc.	No	FW
6,300	32.0	2.55	104	WF	58.0	48.0	Term.	4,300	0	Disc.	No	FW
1,300	13.0	4,000	100	Prim.	40.0	15.0	Term.		600	TETT	Yes	
1,150	20.0	50	100	Prim.	72.0			138	96			
2,500	12.0	2,300	100	Prim.	50.0	12.0	Term. 1986	195	129	Disc.	No	FW
3,000	11.0	17,600	120	Prim.	90.0	40.0	Term.	70	34	Disc.	No	P
1,000	12.0	7,700	97	Prim.	47.0	12.0	PP 9/87	45	45	Disc.	No	FW
350	17.0	6,000	70	None	55.0	27.5				TETT	No	
709	17.0	6,000	65	None	50.0	25.0				TETT	No	
1,400	13.0	13.3	90	Prim.			Term.	140	30	Prom.	Yes	
1,300	16.0	310	95	Prim.				1,000	1,000	Succ.	Yes	
1,100	13.0	8,000	105	Prim.	20.0			550	520	No		
1,800	14.0	800	100	Steam soak	67.0	25.0	Term.	200	150	Disc.	No	P (Exp. UL)
900	13.0	4,000	100	Prim.	55.0	30.0	Term.	100	70	Prom.	Yes	
1,200	13.0	2,000	95	Prim.				1,800	1,630	Succ.	Yes	
3,300	6-10.0	7,000	135	None	68.0		Term.			TETT	No	
200-500	15.0	4,000	100	Prim.	63.0	55.0	Term.	700	350	TETT	Yes	
1,800	12.0	700	100	Prim.				700	500	Succ.	Yes	
2,400	13.0	4,000	100	Prim.	65.0	55.0	Term.	170	134	Prom.	Yes	
950	14.0	2,340	100	Steam stimulation	58.0	25.0	Term.	125		TETT	TETT	
2,000	13.0	1,800	122	Steam stimulation	50.0	20.0	Term. 8/86	1,250	1,250	Prom.	Yes	
2,300	8.0	100,000	110	None			Term. 6/86	689	689	Succ.	Yes	
500	13.0	1,680	90	Prim.	55.0	22.0	Term.	15	15	Succ.	Yes	P (Exp. UL)
2,610	10.4	13-25000	110	Cyclic steam stim.			Term. 4/86	378	378	Prom.	Yes	
400-2,700	11-24.0			Prim.	53.0	17.0	Term.	25	0	Prom.	Yes	P (Exp. UL)
3,000	10.0	14,000	130	Prim.			Term.	103	103	Succ.	Yes	
1,900	12.0	75	110	Prim.	40.0	31.0	Term.	140	0	Disc.	No	P (Exp. UL)
3,000	9.0	580	85	Cyclic	65.0	61.0	Term.	1,900	200	Disc.	No	P (Exp. UL)
1,100	11.3	300	180	Steam soak	60.0	30.0	Term.	290	0	Succ.	Yes	FW
740	13.7	450	130	Prim.	62.0	41.0	Term.	25	0	Succ.	Yes	FW
770	13.6	450	130	Prim.	59.0	40.0	Term.	25	0	Succ.	Yes	FW
1,900	14.0	700	106	Prim.	50.0	35.0	Term.	5	0	Disc.	No	P (Exp. UL)
3,500	9.0	20,000	110	Prim.	60.0	45.0	Term.	0	0	Disc.	No	P (Exp. UL)
1,200	13.0	700	150	Steam soak	55.0	35.0	Term.	160	0	Succ.	Yes	FW

Pipeline Economics Report



IN THIS REPORT...

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New construction plans up; revenues, incomes continue to decrease

Warren R. True
Pipeline/Gas Processing Editor

Plans for new gas pipelines exploded in 1987-88 as companies rushed to take advantage of expected increased demand for natural gas in U.S. Northeast markets.

More than 5,000 miles of pipeline were proposed in construction-permit (CP) applications to the U.S. Federal Energy Regulatory Commission. Nearly 40% of this total is intended for the Northeast.

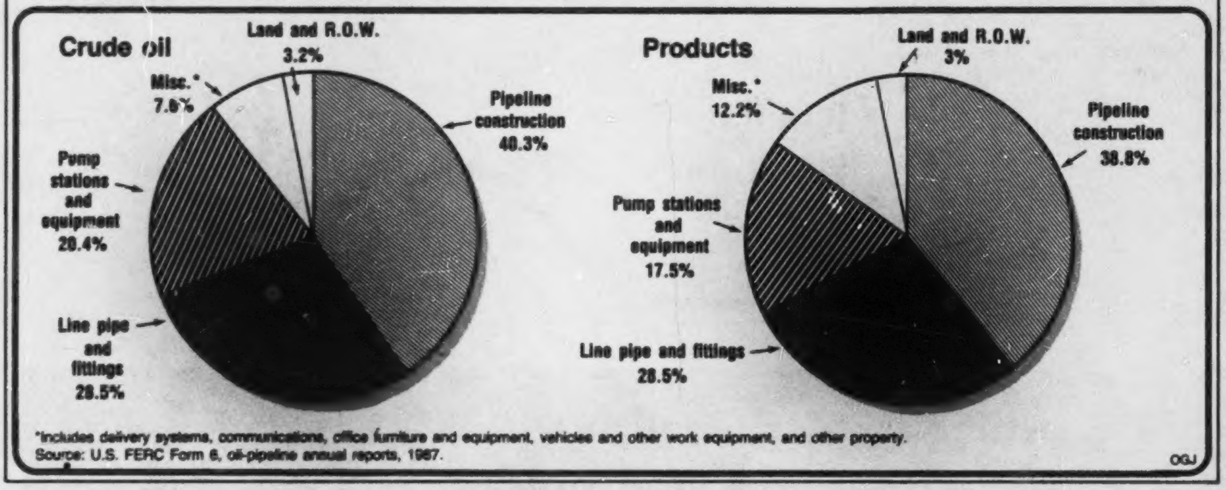
On the other hand, revenues and incomes of gas-pipeline companies took another beating in 1987 as the companies continued to struggle with the industry restructuring wrought by FERC Order 436.

The intent of that order when issued in 1985, and of subsequent orders, was to bring greater competition to the interstate transportation of natural gas. The effect so far, combined with lingering low demand for gas, has been to squeeze operating-companies' revenues and incomes.

Continued declines. Operating revenues for liquids-pipeline companies dropped by $229.8 million (−3.15%). Their incomes, however, showed a significant increase, up $423.7 million (20.6%). Revenues and incomes for natural-gas pipeline companies, as stated, continued their steep declines of recent years.

Fig. 1

Liquid-pipeline investment



*Includes delivery systems, communications, office furniture and equipment, vehicles and other work equipment, and other property.
Source: U.S. FERC Form 6, oil-pipeline annual reports, 1987.

Major gas-pipeline companies' operating revenues for 1987 fell $6 billion (−20.3%) with incomes off $232.5 million.

All natural-gas pipeline companies' revenues for 1987 were off even more, by $8.6 billion (21.3%); all companies' incomes were down $324.2 million (−19.6%).

Mileage operated by the 264 liquids and natural-gas pipeline companies also fell last year (Table 1). Total mileage was reported at 447,950, off 3,945 miles (−0.9%).

Crude-oil and products pipeline companies operated 167,865 miles of gathering and trunk lines in 1987, down 2,119 miles (−1.3%). This mileage handled crude oil, crude-oil products, and NGL's.

The decline is entirely made up of drops in products mileage.

Mileage for all natural-gas pipeline companies increased fractionally; mileage for major gas-pipeline companies fell, also fractionally.

Construction pace. Proposed construction activity for the natural-gas pipeline industry burst out in the period between July 1, 1987, and June 30 of this year as more than 5,000 miles of gas pipeline were proposed to the FERC (Table 2).

During the period covered, 129 land and 3 offshore projects were proposed for construction, compared with 106 for the previous 12-month period.

Proposed mileage for these projects jumped by 4,215.34 miles (323%) over the mileage for the projects proposed in the 1986-87 period: 5,519.75 miles compared with 1,304.51.

Oil & Gas Journal's Worldwide Construction Report (OGJ, Oct. 24, p. 33) lists 83 individual pipeline projects totaling more than 11,400 miles of U.S. pipeline construction reported by surveyed companies as either proposed, planned, or under way.

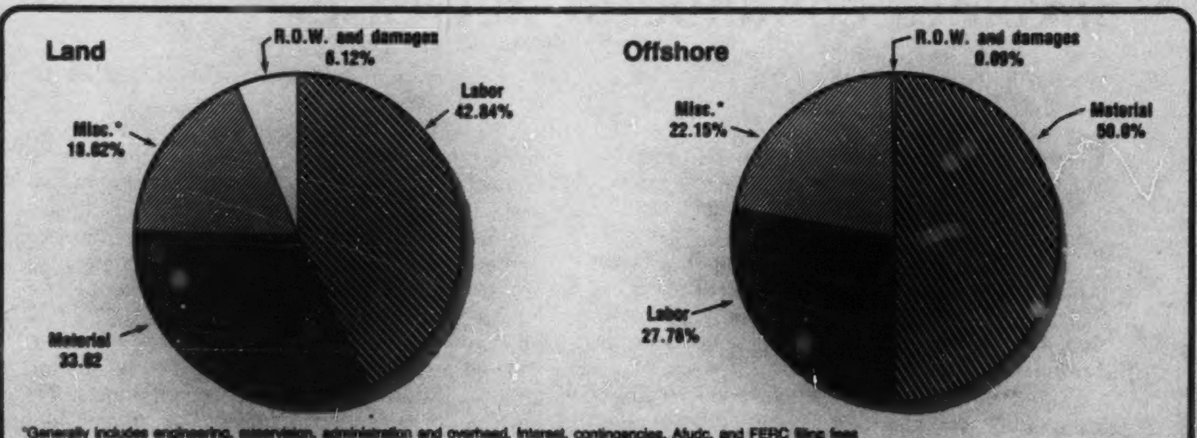
By comparison, OGJ's Oct. 26, 1987, construction report listed 61 U.S. pipeline projects proposed, planned, or under way, totaling more than 13,560 miles. In a year's time, the total number of projects reported by the Journal has dropped by 22 (34%) while the mileage has dropped by 2,160 miles (15.9%).

Natural-gas pipeline projects reported in this year's construction report total 8,779 miles of pipeline. The report a year ago listed 51 gas-pipeline projects totaling more than 8,300 miles.

Prospects for some of these lines being built are better now than at any time in the last 5 years.

Fig. 2

Gas-pipeline construction costs



*Generally includes engineering, supervision, administration and overhead, interest, contingencies, Afudc, and FERC filing fees
Source: U.S. FERC construction-permit applications, July 1, 1987, to June 30, 1988.

Table 1

U.S. interstate pipeline mileage

Year	Miles Gas	Liquid	Total
1978	258,576	162,452	421,028
1979	264,134	169,794	433,928
1980	274,248	172,673	446,921
1981	274,634	172,815	447,449
1982	286,999	172,549	459,548
1983	285,204	167,819	453,023
1984	*258,379	173,922	*432,301
1985	*279,395	171,401	*450,796
1986	*281,881	170,014	*451,895
1987	*280,085	167,865	*447,950

Source: U.S. FERC Form 6 Annual Reports—oil pipelines; Forms 2 & 2A—gas pipelines.

*Reflects operating mileage as reported under the FERC's classification system for natural-gas pipeline companies effective beginning with the 1984 reporting year. Only major gas-pipeline companies are required to file mileage. See table GAS COMPANIES, p. 60, for definition of major and nonmajor companies and details of companies reporting mileage for 1987.

Nonetheless, many projects are competing for the same markets, as Table 2 shows, or may still become uneconomical in the currently mercurial petroleum markets.

This seems especially true for pipelines proposed to bring natural gas from Alaska into the lower U.S., and the myriad of major system additions and expansions into the U.S. Northeast, as well as for projects competing to supply natural gas to EOR projects in California.

Through 1986 and into last year, projects to supply natural gas to the Mid-Atlantic and Northeast states had so proliferated that a year ago (OGJ, Aug. 24, 1987, p. 13) the FERC dismissed without prejudice more than 70 of the estimated 126 applications that had been filed.

This was an effort to wring some order from among the large number of proposals.

In declaring an "open season" on U.S. Northeast gas-expansion projects through Dec. 1 of last year, the commission sought to encourage sponsors of dismissed applications to update, amend, and refile applications, complying with the latest agency regulations.

The result was the large spurt in projects and mileage evident in this year's report (Table 2).

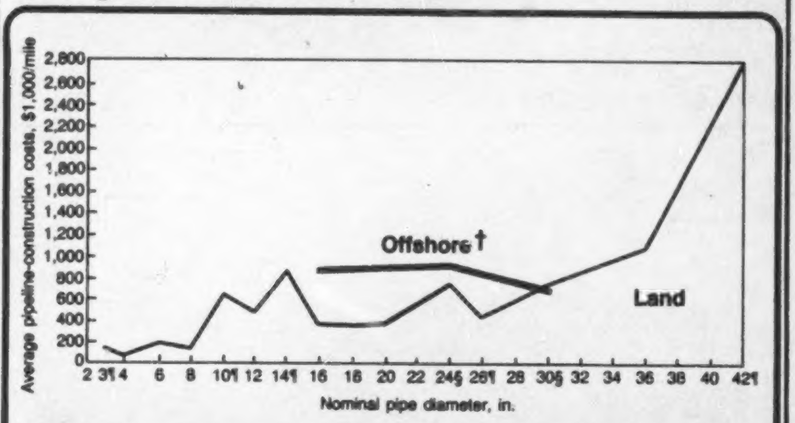
Crude-oil projects in the lastest Oil & Gas Journal Worldwide Construction Report total six comprising 1,820 miles.

Here, also, the constrcution report a year earlier lists four crude-oil pipeline projects totaling 1,809 miles.

Finally, the latest Journal report shows 11 product-pipeline projects with 874 miles of pipeline. A year earlier, six projects totaling 590 miles were reported.

Fig. 3

Average construction costs*

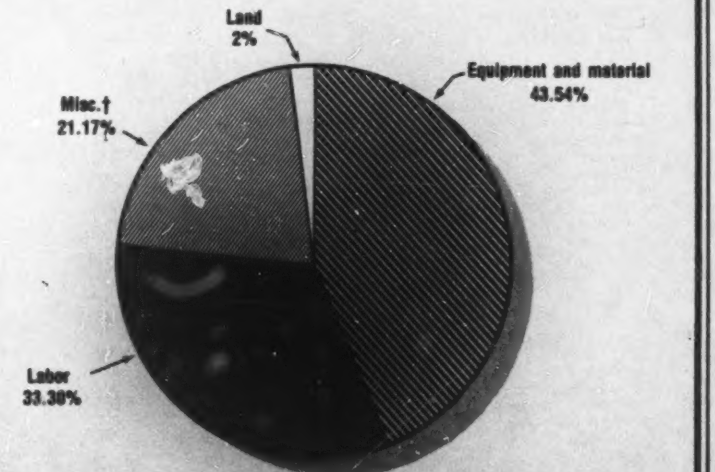


*For gas-pipeline construction in U.S. †One project for each diameter. §Includes river or channel crossing. ¶One project.

OGJ

Fig. 4

Compressor-station cost split*



*Land stations only; no offshore compressor-station projects were proposed for the period covered.

†Generally includes engineering, supervision, administration and overhead, interest, contingencies, Afudc and FERC filing fees. U.S. FERC construction-permit applications, July 1, 1987 to June 30, 1988.

OGJ

U.S. interstate network

Revenue, income, and mileage declines cited earlier are evident on the pipeline-company tables (pp. 57,60).

These data are based on annual reports of the regulated interstate pipeline companies and provide a variety of detail on each of them, including pipeline mileage, crude-oil and refined-products deliveries, natural-gas sales, operating revenues, and net incomes. For the first time, these tables also give data on natural-gas deliveries for others, a figure which reflects the changing structure of the natural-gas transportation industry.

System utilization. For any year, comparisons of U.S. petroleum and natural-gas pipeline mileages must be done with care for two reasons:

The number of companies required to file reports with the FERC varies each year. Second, the FERC's system for classifying interstate natural-gas pipeline companies changed beginning with the 1984 reporting year (OGJ, Nov. 25, 1985, p. 55).

Companies are now classified as "major" or "nonmajor" based on total natural-gas transmissions for each of the three previous reporting years. (See FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011.)

Major pipeline companies are those whose combined gas sold for resale and gas transported or stored for a fee exceeded 50 bcf at 14.73 psi (60° F.) in each of the three previous calendar years.

Nonmajors are companies not classified as majors and having had total gas sales of volume transactions exceeding 200 MMcf at 14.73 psi (60° F.) in each of the three previous calen-

Current pipeline costs

Size, in.	Location*	Length, miles	Cost, $ Material	Labor	Misc.†	R.O.W. & damages	Total	$/mile
ONSHORE PIPELINES								
3	Arkansas	1.25	36,000	92,000	63,942	16,000	207,942	166,354
4	Oklahoma-Texas	2.55	57,461	86,792	29,173	27,321	200,747	78,724
6	Oklahoma-Texas	0.25	5,634	8,511	2,861	2,679	19,685	78,740
6	Massachusetts (R)	0.53	63,200	204,450	71,510	1,000	340,160	641,811
6	Louisiana (R)	3.77	164,569	206,000	155,131	60,300	586,000	155,438
8	Tennessee (L)	1.10	76,500	100,580	47,320	17,600	242,000	220,000
8	Arizona	3.07	175,000	164,000	108,000	15,000	462,000	150,489
8	Arkansas	3.20	125,400	109,200	98,639	40,700	373,939	116,856
8	Wyoming	4.35	311,000	287,000	183,940	16,000	797,400	183,434
10	Massachusetts (R)	0.53	62,200	204,450	71,510	1,000	340,162	641,811
12	Utah	0.66	150,700	47,100	26,800	–	224,600	340,303
12	Connecticut (L)	1.10	200,000	675,000	225,182	115,000	1,215,182	1,104,711
12	Massachusetts (L)	1.20	259,000	965,000	367,622	657,000	2,248,622	1,873,852
12	Connecticut	2.00	276,300	913,400	461,289	224,000	1,874,989	937,495
12	Massachusetts	3.40	369,900	1,199,700	695,305	462,000	2,726,905	802,031
12	Maine-Rhode Island	4.50	563,900	1,407,500	733,301	216,000	2,920,701	649,045
12	New Hampshire	4.50	416,000	1,268,200	666,565	180,000	2,530,765	562,392
12	Massachusetts	6.10	572,700	1,619,300	833,670	294,000	3,319,670	544,208
12	Kentucky	25.22	1,750,000	3,722,000	858,000	270,000	6,600,000	261,697
12	Pennsylvania-N.J.	37.90	2,843,000	11,400,900	2,894,695	2,151,000	19,285,595	508,976
14	Mass.-N. Hampshire	37.00	7,810,500	15,840,710	6,343,650	1,976,120	31,970,980	864,081
16	Massachusetts (L)	0.60	214,000	868,000	219,853	52,000	1,353,853	2,256,422
16	Rhode Island (L)	0.60	171,000	550,000	74,657	100,000	895,657	1,492,762
16	Oklahoma	0.90	86,000	67,000	25,033	7,000	185,033	205,592
16	Massachusetts (L)	1.20	210,000	420,000	207,392	110,000	947,392	789,493
16	Rhode Island (L)	1.30	321,000	788,000	264,025	131,000	1,504,025	1,156,942
16	Massachusetts	2.20	692,600	3,437,500	230,392	101,700	4,462,192	2,028,269
16	Pennsylvania	2.25	511,101	852,445	273,753	35,450	1,672,749	743,444
16	Massachusetts (L)	3.60	994,000	3,275,000	439,953	455,000	5,163,953	1,434,431
16	Connecticut	11.50	1,749,300	3,117,900	1,783,430	1,100,000	7,750,063	673,968
16	California	17.00	1,317,519	2,234,497	991,330	565,420	5,108,765	300,516
16	New Jersey	19.10	2,554,400	7,350,600	2,045,095	2,218,700	14,168,795	741,822
16	Indiana (L)	59.01	6,274,000	7,767,000	2,798,528	1,302,000	18,141,520	307,431
16	Okla.-Missouri	78.60	7,507,000	6,034,000	1,837,033	592,000	1,597,033	203,181
20	Utah	0.14	274,100	68,000	36,540	–	378,640	2,704,457
20	Alabama	0.25	340,021	236,648	113,035	4,400	694,104	2,776,416
20	Massachusetts (L)	1.20	146,200	903,000	300,315	154,000	1,503,515	1,252,929
20	Kentucky (L)	3.42	515,000	603,000	163,420	1,000	1,282,420	398,368
20	New Jersey	3.81	748,700	1,507,507	597,435	187,500	3,041,142	798,221
20	West Virginia	4.70	538,000	941,600	159,900	12,500	1,652,000	351,489
20	Wyoming	6.00	638,560	926,881	493,810	199,560	2,258,811	376,469
20	Massachusetts	11.00	3,345,000	8,115,000	2,785,398	2,145,000	16,390,398	1,490,036
20	Pennsylvania	27.60	4,466,500	7,564,800	1,632,700	1,456,000	15,120,000	547,826
20	Indiana	68.28	9,614,000	10,639,000	3,824,920	1,968,000	26,045,920	381,458
20	Utah	77.00	8,671,300	6,170,200	2,392,200	353,800	17,587,500	246,260
20	Indiana-Ohio	110.00	14,360,000	15,640,000	5,924,100	2,050,560	37,974,750	345,225
24	Tennessee (C)	0.48	388,500	1,202,000	428,300	40,000	2,058,800	4,289,167
24	Massachusetts	1.50	643,000	2,300,000	303,690	15,000	3,261,690	2,174,460
24	Massachusetts	1.50	643,000	2,110,000	472,827	15,000	3,240,827	2,160,551
24	Pennsylvania-New Jersey	5.31	1,369,267	4,133,997	795,683	239,272	6,538,219	1,231,303
24	New Jersey	8.60	2,402,200	5,172,800	2,475,375	50,000	10,640,375	1,237,253
24	New York	20.00	4,254,000	3,307,000	951,651	450,000	8,962,651	448,133
24	Pennsylvania	27.00	4,851,000	8,030,300	2,015,153	595,700	15,492,153	573,783
24	Wyoming	33.00	4,222,282	5,825,900	3,080,314	1,097,580	14,226,076	431,093
24	California	35.00	5,316,832	6,184,521	2,921,861	1,164,100	15,587,314	445,352
24	Pennsylvania	40.34	9,640,000	8,608,000	3,390,179	1,061,000	22,699,179	562,697
24	Connecticut-New York	60.30	23,915,000	53,305,000	15,013,702	6,770,000	99,003,702	1,641,852
24	New York	76.00	17,573,00	27,880,000	9,784,786	1,862,000	57,099,786	751,315
24	New York	83.00	18,173,000	26,690,700	12,773,334	3,000,000	60,637,034	730,567
24	Florida	140.00	34,700,000	19,265,000	16,242,816	8,960,000	79,167,816	565,484
24	Vermont-Massachusetts	254.00	53,689,500	108,889,200	43,606,350	13,583,880	219,768,930	865,232
26	California	44.00	5,849,938	8,526,370	3,657,165	1,463,440	19,496,913	443,112
30	Ontario-New York (C)	0.50	178,900	1,668,700	566,484	15,000	2,429,084	4,858,168
30	Alabama	1.00	742,003	416,380	245,276	17,600	1,421,259	1,421,259
30	Massachusetts	1.00	286,000	713,200	413,904	40,000	1,453,104	1,453,104
30	New York (L)	1.00	269,100	489,200	358,189	32,000	1,148,489	1,148,489
30	New York (L)	1.00	414,900	614,000	419,552	32,000	1,480,452	1,480,452
30	Massachusetts (L)	1.50	407,500	1,004,700	532,747	82,000	2,026,947	1,351,298
30	Massachusetts (L)	2.00	632,600	1,532,100	695,240	98,000	2,957,940	1,478,970

dar years.

One effect of this change has been that companies classified as "nonmajor" are exempt from filing certain data, chief among the excluded figures being mileage and gas-sales or transportation figures.

Many companies nonetheless file such data voluntarily.

Figures for these nonmajor companies should be excluded from a calculation of total U.S. interstate pipeline

Table 2

			Cost, $					
Size, in.	**Location***	**Length, miles**	**Material**	**Labor**	**Misc.†**	**R.O.W. & damages**	**Total**	**$/mile**
OFFSHORE PIPELINES—continued								
30	New York (L)	2.50	1,030,600	1,171,000	736,583	177,000	3,115,183	1,246,073
30	New York (L)	2.70	1,440,100	1,461,400	832,054	194,000	3,631,554	1,345,020
30	New York (L)	3.20	790,900	1,424,800	722,261	80,000	3,017,961	945,613
30	Massachusetts (L)	3.30	885,000	2,101,000	1,005,006	178,000	4,169,006	1,263,335
30	New York (L)	3.40	874,500	1,479,500	787,560	93,000	3,234,560	951,341
30	Pennsylvania	3.43	1,473,094	2,111,658	670,489	32,940	4,288,181	1,250,199
30	New York (L)	3.60	905,200	1,628,400	826,210	80,000	3,439,810	955,503
30	Pennsylvania (L)	3.80	1,126,900	1,703,700	955,105	122,000	3,907,705	1,028,343
30	Alabama	4.00	1,394,000	768,000	654,486	256,000	3,072,486	768,122
30	Massachusetts (L)	4.40	1,289,200	3,854,200	1,654,481	177,000	6,974,881	1,585,200
30	New York (L)	4.60	1,192,800	2,091,700	1,078,008	183,000	4,545,508	988,154
30	New York (L)	5.00	1,230,800	2,203,100	1,103,093	160,000	4,696,993	939,399
30	Pennsylvania (L)	5.15	1,917,490	2,870,686	1,197,102	82,400	6,067,678	1,178,190
30	Massachusetts (L)	5.30	1,428,400	3,389,500	1,527,826	290,000	6,635,726	1,252,722
30	Pennsylvania (L)	14.30	4,602,700	6,043,000	3,174,299	413,000	14,232,999	995,315
30	New York (L)	17.70	4,525,000	6,800,300	3,466,749	565,000	15,357,049	867,430
30	New York (L)	23.20	6,053,800	8,790,200	4,493,000	742,000	20,079,000	865,474
30	Alabama	24.50	8,446,221	4,377,500	3,499,716	436,200	16,759,637	684,067
30	Pennsylvania	24.97	7,655,500	11,049,900	3,585,800	1,013,800	23,305,000	933,320
30	New York (L)	28.10	10,759,200	12,099,500	6,863,617	3,023,000	31,745,317	1,129,727
30	Wyoming	30.80	7,226,512	6,844,839	4,057,015	1,024,408	19,152,774	621,843
30	New Jersey-New York	38.70	22,151,000	49,449,000	8,908,885	2,500,000	83,008,885	2,144,932
30	California	62.20	10,806,743	13,810,051	6,071,256	2,068,772	32,756,822	526,637
30	Florida	76.00	27,374,000	12,262,000	10,926,729	4,864,000	55,426,729	729,299
30	Massachusetts	81.00	32,620,000	67,720,000	18,973,170	11,705,000	131,018,170	1,617,508
30	Alabama-Mississippi	87.50	27,466,500	20,623,900	14,340,696	2,560,000	64,991,096	742,755
30	New York-Massachusetts	274,000	87,405,000	154,330,000	52,194,156	22,795,000	316,724,156	1,155,928
30	Pennsylvania	285.00	78,268,000	76,373,000	35,997,767	15,904,000	206,542,767	724,711
30	Wyoming-California	553.50	135,640,498	122,887,945	64,472,402	18,409,410	341,410,255	616,821
36	New Jersey	1.00	780,000	1,489,000	292,100	64,000	2,625,100	2,625,105
36	New York (L)	1.90	730,130	1,109,300	611,711	56,000	2,507,141	1,319,532
36	New York-Massachusetts	2.00	731,800	1,271,900	696,792	64,000	2,764,492	1,382,246
36	Pennsylvania	3.97	1,999,427	2,099,871	785,813	255,200	5,140,311	1,294,787
36	New Jersey	4.08	1,998,948	4,741,007	1,795,335	600,670	9,136,050	2,239,228
36	New York (L)	5.10	1,820,200	2,292,000	1,269,438	139,000	5,520,638	1,082,478
36	Connecticut (L)	5.20	3,155,000	5,710,000	1,633,939	995,000	11,493,939	2,210,373
36	Massachusetts (L)	5.50	2,675,000	4,325,000	1,372,184	1,220,000	9,592,184	1,744,033
36	New Jersey (L)	6.00	3,085,000	6,185,000	1,846,288	1,295,000	12,411,288	2,068,548
36	Connecticut (L)	6.40	3,610,000	6,830,000	1,958,853	1,295,000	13,693,853	2,139,665
36	Massachusetts (L)	7.00	2,511,700	4,737,100	2,205,198	224,000	9,677,998	1,382,571
36	Massachusetts (L)	7.00	3,945,000	5,575,000	1,835,390	1,295,000	12,650,390	1,807,199
36	New York (L)	8.50	4,855,000	6,315,000	2,036,985	1,750,000	14,956,985	1,759,645
36	New York (L)	9.00	3,233,600	4,056,200	2,187,331	245,000	9,731,131	1,081,237
36	New York (L)	9.00	3,235,900	4,309,200	2,258,132	245,000	10,048,232	1,116,470
36	New York (L)	9.50	3,567,600	4,240,400	2,327,130	304,000	10,439,130	1,098,856
36	Connecticut (L)	10.60	5,315,000	10,795,000	3,139,490	1,810,000	21,059,490	1,986,744
36	Pennsylvania	10.80	4,340,800	6,461,500	3,133,151	259,000	14,194,451	1,314,301
36	Pennsylvania	10.92	4,562,833	5,197,170	1,995,804	696,000	12,451,807	1,140,349
36	Pennsylvania (L)	11.25	5,094,156	8,757,032	1,685,493	506,848	16,043,529	1,426,092
36	Pennsylvania (R)	11.36	5,138,115	8,796,155	1,693,024	509,113	16,136,407	1,420,458
36	Pennsylvania (L)	11.90	4,278,900	5,028,200	2,726,305	324,000	12,357,405	1,038,437
36	Pennsylvania (L)	12.48	6,747,961	7,611,184	3,628,304	399,400	18,386,849	1,474,908
36	New York (L)	12.90	6,595,000	9,100,000	3,213,198	2,490,000	21,398,198	1,658,775
36	Connecticut (L)	16.50	8,450,000	15,625,000	4,822,968	3,190,000	32,087,968	1,944,725
36	Pennsylvania	24.25	11,872,000	21,317,000	4,335,005	1,455,000	38,979,005	1,607,382
36	Penn.-New Jersey	37.93	19,493,000	37,729,000	6,985,452	1,649,000	65,856,452	1,736,263
36	Massachusetts	45.90	19,266,800	28,080,500	16,402,393	14,688,000	78,437,693	1,708,882
36	California	225.30	76,021,359	56,420,950	31,037,406	7,493,478	170,973,193	758,869
36	Iowa-Illinois	371.30	129,144,000	120,513,000	75,149,998	8,208,648	333,015,646	896,888
42	New Jersey	2.56	2,057,000	4,088,000	794,992	246,000	7,185,992	2,807,028
Total/Onshore projects		**5,118.45**	**1,111,105,874**	**1,441,842,887**	**806,328,053**	**205,829,349**	**3,364,805,963**	**657,388**
1987-report total/onshore		**1,300.31**	**308,841,124**	**428,232,436**	**136,274,987**	**43,887,786**	**919,648,343**	**707,253**
OFFSHORE PIPELINES								
16	Louisiana	0.30	116,471	131,125	27,617	113	275,326	904,420
24	Louisiana	13.00	5,530,529	5,670,875	1,194,383	4,887	12,400,674	953,898
30	Alabama-Florida	386.00	145,909,000	78,324,000	66,210,755	–	290,443,755	748,566
Total/offshore projects		**401.30**	**151,556,000**	**84,126,000**	**67,432,755**	**5,000**	**303,119,755**	**755,345**
1987 report total/offshore projects		**4.2**	**745,000**	**1,700,000**	**1,021,880**	**–**	**3,466,880**	**825,395**
Total/all projects		**5,519.75**	**1,262,661,874**	**1,525,968,887**	**873,760,808**	**205,829,349**	**3,667,925,718**	**664,509**
1987 report total		**1,304.51**	**309,586,124**	**429,932,436**	**137,296,867**	**43,887,786**	**923,115,003**	**707,634**

Source: U.S. FERC construction permit applications, July 1, 1987, to June 30, 1988.

*L = Loop; R = Replacement; C = River or channel crossing. † Generally includes engr., supv., surveying, interest, adm. & overheads, contingencies, Afudc, and FERC fees.

Table 3

Investment in liquids pipelines

	Company and investment, $ A	B	C	D	E	Total, $	%
CRUDE PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	1,787,499	814,497	292,759	979,827	1,189,920	5,064,502	0.30
Right of way	12,169,423	1,004,094	316,392	16,516,482	15,068,015	45,074,406	2.71
Line pipe	134,882,674	25,700,801	7,797,471	96,144,263	153,364,612	417,889,821	25.15
Line pipe fittings	9,490,351	922,085	1,387,778	17,401,123	27,527,324	56,728,661	3.41
Pipeline construction	189,654,709	27,801,794	10,931,879	219,879,456	222,164,700	670,432,538	40.34
Buildings	21,184,793	4,951,147	2,457,791	13,566,759	9,918,148	52,078,638	3.13
Boilers	—	—	—	—	—	—	
Pumping equipment	24,302,627	5,524,747	2,414,882	17,169,861	48,657,207	98,069,324	5.90
Machine tools and machinery	—	—	—	33,140	—	33,140	—
Other station equipment	89,380,146	21,330,115	4,593,316	45,152,887	29,575,598	190,032,062	11.44
Oil tanks	14,494,825	6,038,119	5,678,530	16,653,577	26,446,336	69,311,387	4.17
Delivery facilities	—	—	5,327,265	1,494,974	6,819,985	13,642,224	0.82
Communications systems	710,337	3,225,009	68,631	10,506,049	3,382,127	17,892,153	1.08
Office furniture and equipment	1,689,985	221,313	215,058	1,727,360	891,704	4,745,420	0.29
Vehicles and other work equip.	7,519,510	786,939	515,392	5,852,776	243,243	14,917,860	0.90
Other property	—	1,203,646	—	—	4,659,326	5,862,972	0.35
Total	**$507,266,879**	**$99,524,306**	**$41,987,144**	**$463,078,534**	**$549,908,245**	**$1,861,775,108**	***100.00**
PRODUCT PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	4,095,422	1,763,961	532,035	936,527	3,241,861	10,569,806	0.37
Right of way	28,739,531	10,829,964	20,111,183	8,776,412	6,750,443	75,207,533	2.60
Line pipe	340,532,482	67,590,647	108,516,930	87,679,163	97,788,462	702,107,684	24.29
Line pipe fittings	72,088,338	12,874,224	15,611,443	1,704,032	20,932,923	123,210,960	4.26
Pipeline construction	566,607,912	109,220,477	206,225,286	102,019,195	137,781,102	1,121,853,972	38.81
Buildings	23,930,483	4,026,100	4,997,792	10,566,018	17,617,962	61,138,355	2.11
Boilers	—	—	—	—	—	—	—
Pumping equipment	45,782,626	6,160,023	31,921,749	28,220,704	24,012,357	136,097,459	4.71
Machine tools and machinery	—	—	—	—	363,318	363,318	0.01
Other station equipment	119,871,056	21,184,953	39,746,989	23,304,697	105,543,108	309,650,803	10.71
Oil tanks	48,805,418	17,220,724	9,035,479	17,465,781	51,130,650	143,658,052	4.97
Delivery facilities	—	—	9,594,441	10,811,906	45,787,494	66,193,841	2.29
Communication systems	1,269,854	369,627	2,239,628	8,742,968	—	12,622,077	0.44
Office furniture and equipment	10,248,198	2,374,190	2,468,937	618,384	773,120	16,482,829	0.57
Vehicles and other work equip.	5,498,272	1,809,909	7,911,262	2,235,838	2,041,276	19,496,548	0.67
Other property	72,979,021	—	19,089,144	—	—	92,068,165	3.18
Total	**$1,340,446,613**	**$255,424,799**	**$478,002,298**	**$303,081,825**	**$513,764,067**	**$2,890,721,402**	***100.00**

Source: U.S. FERC Form 6, Annual Report of Oil Pipeline Companies, Dec. 31, 1987.

* Actual total may be inexact due to rounding.

utilization for any given year because of their unreliability year to year.

Therefore, combining 1987 mileage data for all regulated liquids-pipeline companies (167,865) with mileage reported by the major natural-gas pipeline companies (42 companies reporting 252,447 miles) yields a total figure of 420,312. This represents less than 1% decrease of 3,343 miles over comparable figures reported for 1986 (170,014 + 253,641 = 423,655).

This compares with a similarly small change for 1986 over 1985, a drop of only 156 miles for all liquids and major natural-gas pipelines.

At the end of 1987, reports from liquids-pipeline companies show a total of 35,055 miles of gathering lines, 54,886 miles of crude-oil trunk lines, and 79,924 miles of products pipelines.

For liquids pipeline companies, the criterion determining which company must file an annual report (Form 6) is whether the FERC determines the company to be an interstate common-carrier pipeline.

These reports for 1986 show that gathering lines increased by 846 miles (2.5%) and crude lines by 733 miles (1.4%) over totals reported for 1986. Products lines decreased by 3,728 miles (−4.6%).

These figures reverse patterns evident in figures reported for 1986 compared with those for 1985 and is in line with the erratic pattern of liquids-pipeline utilization for the past 7 years (Table 1).

Natural-gas transmission lines were down over 1986 by 3,084 miles (−1.5%) for all companies and by 3,697 miles (−2%) for major companies. Field lines for all companies showed a fractional increase of 47 miles but fell among major companies, by 792 miles.

For all companies as well as majors, storage lines increased last year over 1986: up 3,552 miles (61.7%) for all companies and 3,295 miles (65%) for majors.

Deliveries rise. Throughput for liquids-pipeline companies in 1987 showed a very slight gain over 1986.

Natural-gas pipelines sales fell again in 1987, by 1.9 tcf (−23.6%) for majors and by almost 2.2 tcf (−22.8%) for all companies.

Aware of how the nation's interstate natural-gas pipeline companies are changing their historical business functions from being buyers-for-resale to transporters, Oil & Gas Journal for the first time has begun collecting figures for companies' volumes of gas transported for others in 1987.

For last year, all regulated U.S. interstate gas pipelines carried 13.5 tcf of gas for others; majors carried nearly 12.9 tcf of that.

Volumes of gas transported for others by all gas-pipeline companies comprised almost 65% of the total volume of gas (20.8 tcf) that moved through U.S. interstate systems in 1987. For major companies (whose total volumes were just shy of 19.2 tcf), the share was a bit larger: slightly more than 67%.

In future reports, trends in the transportation of gas for others will be examined.

Crude-oil and product deliveries last year again exceeded 11 billion bbl, an increase over 1986 of 112 million bbl, or only about 1%.

Crude-oil deliveries actually fell last year by 8.8 million bbl or less than 1%. Product deliveries, reflecting increased U.S. refinery utilization, rose by 200.8 million bbl (4.3%).

Trunkline traffic for U.S. crude-oil and product pipelines was flat last year, advancing by only 33 billion bbl-miles (0.96%) over that for 1986.

Crude-oil trunkline traffic increased by a modest 18.7 billion bbl-miles (2%). Product traffic fell by 5 billion bbl-miles (0.3%).

Rankings. Oil & Gas Journal ranks the top 10 natural-gas and liquids pipeline companies in three categories: Mileage, natural-gas sales or liquids barrel-mile throughput, and operating income (pp. 47, 50). These rankings are broken out from the pipeline-company tables (pp.57, 60).

For all natural-gas pipeline companies, net income as a portion of gas-plant investment continued its slide of recent years, falling to 2.7% in 1987 from 3.4% in 1986, 4.5% in 1985, and 8.7% in 1984.

For major gas pipelines, net income as a portion of gas-plant investment mirrored the trend, falling to 2.6% from 3.2% in 1986, 4.3% in 1985, and 7.6% in 1984.

For 1987, all gas companies reported an industry gas-plant investment totaling more than $49.9 billion compared with $49.4 billion for 1986 and $48.3 billion for 1985.

Majors' gas-plant investment in 1987 fell to slightly less than $42 billion from $42.2 billion for 1986.

For interstate common-carrier liquids pipeline companies, net income as a percentage of investment in carrier property was 11.6% in 1987 compared with 9.2% in 1986, 11.3% in 1985, and 13.1% in 1984.

Liquids pipelines' investment in carrier property for 1987 fell by almost $22.4 million (−4.96%) to slightly less than $22.3 billion compared with $22.4 billion last year, $21.6 billion in 1985, and $19.4 billion in 1984.

Another measure of the profitability of oil and natural-gas pipeline companies in recent years is to look at the percentage net income represents of operating income. Trends for liquids-pipeline companies and for natural-gas pipeline companies have been heading in opposite directions for the past 10 years.

For liquids-pipeline companies in 1987, this figure rose to 35% from 28% in 1986 and 21.9% in 1978. The figure for 1986 represents the only year the percentage has declined (from 32.6% for 1985).

By contrast for all natural-gas pipeline companies, income as a percentage of operating revenues has been steadily falling in the past 10 years.

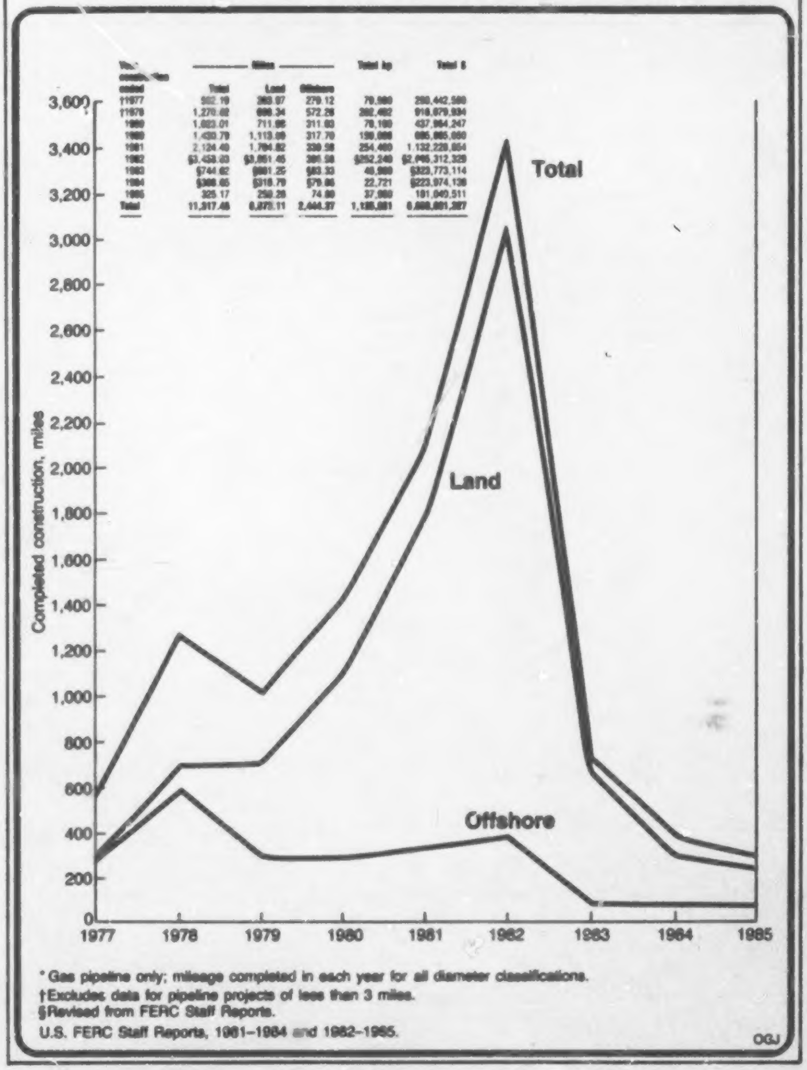
At the end of 1987, it stood at slightly more than 4%, fractionally higher than for 1986 but continuing the downward trend since 1978 when it was 8.3%.

Tracked companies. In this annual Pipeline Economics Report, Oil & Gas Journal has for several years been tracking investment by five crude-oil pipeline companies and five products-pipeline companies.

Table 3 indicates that investment by the five crude-oil pipelines stood at $1,661.8 million at the end of 1987 compared with $1,629 million at the end of 1986, an insignificant increase of $32.8 million (2%).

Fig. 5

U.S. pipeline construction costs: 1977–1985*



Year construction ended	Miles Total	Land	Offshore	Total hp	Total $
†1977	582.19	303.07	279.12	79,980	298,442,580
†1978	1,270.62	698.34	572.28	282,482	918,079,934
1979	1,023.01	711.98	311.03	78,100	437,984,247
1980	1,430.79	1,113.09	317.70	150,000	695,885,060
1981	2,124.40	1,784.82	339.58	254,400	1,132,228,054
1982	§3,438.03	§3,051.45	386.58	§252,240	§2,095,312,329
1983	§744.62	§661.25	§83.33	48,900	§323,773,114
1984	§398.65	§318.79	§79.86	22,721	§223,974,138
1985	325.17	250.28	74.89	37,080	181,049,511
Total	11,317.48	8,873.11	2,444.37	1,185,881	6,868,881,287

* Gas pipeline only; mileage completed in each year for all diameter classifications.

†Excludes data for pipeline projects of less than 3 miles.

§Revised from FERC Staff Reports.

U.S. FERC Staff Reports, 1981–1984 and 1982–1985.

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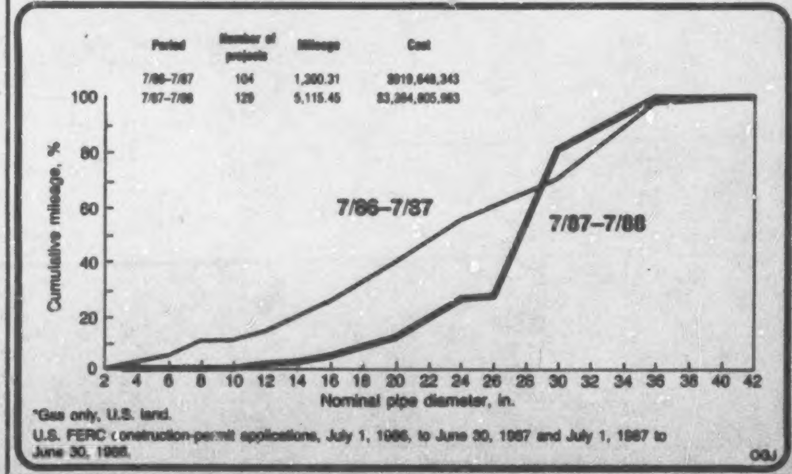
Fig. 6

Diameter distribution for pipelines*



Period	Number of projects	Mileage	Cost
7/86–7/87	104	1,360.31	$919,648,343
7/87–7/88	129	5,115.45	$3,264,805,983

*Gas only, U.S. land.

U.S. FERC construction-permit applications, July 1, 1986, to June 30, 1987 and July 1, 1987 to June 30, 1988.

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Table 4

10-year land construction cost trend

		Average cost, $/mile					Range, $/mile	
Size	Year*	R.O.W.	Material	Labor	Misc.	Total	Low	High
8 in.	1988	7,619	58,695	56,381	37,363	160,058	116,856	220,000
	1987	20,032	55,430	75,568	30,581	181,611	151,193	652,036
	1986	14,763	44,703	63,102	32,958	155,527	137,033	193,846
	1985	3,141	28,144	47,317	16,283	94,884	64,203	228,866
	1984	22,339	49,974	175,733	74,086	322,132	223,767	540,655
	1983	6,244	48,392	89,600	23,088	167,324	159,940	178,020
	1982	8,996	46,002	67,950	31,769	154,717	73,596	572,926
	1981	8,119	34,860	23,528	20,884	87,391	55,981	109,078
	1980	8,247	39,040	102,839	13,036	163,162	149,926	200,554
	1979	1,189	40,692	63,518	14,951	123,350	50,374	581,916
12 in.	1988	52,772	85,487	268,169	89,656	496,085	261,697	1,873,852
	1987	26,018	81,675	161,790	67,404	336,826	166,473	669,332
	1986	43,656	94,786	243,533	101,683	483,657	186,180	1,201,356
	1985	26,582	74,620	106,447	46,164	253,813	131,765	767,548
	1984	23,035	147,750	211,783	93,481	476,050	338,872	608,685
	1983	5,135	91,492	73,042	20,754	190,423	177,050	218,265
	1982	10,536	84,972	102,390	32,173	230,071	130,252	669,227
	1981	3,855	71,444	65,613	11,861	152,773	55,981	369,018
	1980	2,610	54,235	41,089	14,111	112,045	78,428	901,282
	1979	1,590	46,062	47,283	7,121	102,056	96,822	158,185
16 in.	1988	34,217	114,232	185,798	56,558	390,805	203,181	2,256,422
	1987	34,775	109,042	187,216	68,857	399,890	190,946	§3,334,886
	1986	21,474	104,368	183,134	53,546	362,523	302,102	1,071,477
	1985	8,511	80,529	47,708	20,091	156,839	154,746	167,876
	1984	15,106	131,139	111,234	82,747	340,226	231,790	363,718
	1983	31,542	337,088	929,969	278,159	1,576,758	447,890	2,370,748
	1982	6,278	104,319	113,380	21,936	245,913	175,715	430,841
	1981	9,203	110,684	133,968	40,424	294,279	140,674	590,112
	1980	7,404	74,571	57,681	18,050	157,706	118,085	471,972
	1979	....	....	....	....	....	....	....
20 in.	1988	27,225	139,302	170,120	58,787	345,225	246,260	2,776,416
	1987	35,655	139,346	172,071	68,265	415,337	274,034	904,487
	1986	29,227	134,332	182,623	82,657	428,839	175,000	1,077,419
	1985	108,870	187,379	190,886	144,974	632,109	353,088	1,277,454
	1984	16,735	175,406	190,088	63,302	445,531	226,415	616,250
	1983	12,682	147,354	154,811	46,073	360,934	237,600	476,104
	1982	12,284	124,148	128,148	30,649	295,229	210,378	482,464
	1981	8,556	122,659	114,147	30,370	275,732	227,679	1,741,597
	1980	11,470	130,438	73,751	48,213	263,872	157,947	533,265
	1979	....	....	....	....	....	....	....
24 in.	1988	49,494	231,264	360,603	145,358	786,719	431,093	†4,289,167
	1987	34,785	254,677	271,319	110,959	671,741	405,987	2,043,000
	1986	43,746	245,807	378,917	170,094	838,565	355,428	1,607,660
	1985	26,648	296,466	305,437	151,657	780,228	469,318	4,893,740
	1984	29,133	289,487	298,521	128,390	745,531	395,676	1,772,049
	1983	31,416	310,583	501,401	148,993	995,393	608,781	1,649,454
	1982	28,537	508,226	807,847	120,895	1,465,505	(§)	(§)
	1981	30,078	269,414	395,204	127,790	822,486	350,898	826,088
	1980	14,220	162,019	152,406	52,114	380,759	230,122	820,295
	1979	5,268	152,878	193,227	19,206	370,579	(§)	(§)
30 in.	1988	47,502	260,549	322,973	137,019	768,043	526,637	†4,858,168
	1987	25,506	257,158	308,383	161,008	752,054	477,195	1,584,483
	1986	34,035	268,922	253,838	120,603	677,397	188,835	1,571,948
	1985	60,408	320,219	314,878	152,035	847,541	668,640	5,778,947
	1984	20,885	336,043	376,631	183,034	916,592	637,546	1,413,826
	1983	23,872	253,071	348,478	116,084	741,506	660,086	1,683,143
	1982	20,756	296,737	362,787	93,103	773,383	548,396	1,179,760
	1981	14,135	309,364	201,037	73,281	597,817	561,358	4,684,745
	1980	13,206	227,229	134,491	46,018	420,944	319,482	921,772
	1979	25,884	239,454	290,474	35,752	591,560	529,178	604,298
36 in.	1988	59,395	385,007	449,650	204,591	1,098,643	758,869	2,625,105
	1987	45,461	415,118	637,294	144,784	1,242,657	1,170,963	1,923,266
	1986	360,582	428,572	468,960	151,769	1,085,359	714,286	5,264,368
	1985	21,967	389,751	296,742	157,536	865,997	629,179	6,443,590
	1984	36,063	356,876	362,667	152,787	910,393	665,480	2,143,680
	1983	51,436	498,047	490,568	306,666	1,346,717	703,112	2,724,493
	1982	13,429	375,281	176,287	58,733	623,730	615,160	833,546
	1981	5,948	344,374	358,072	74,415	782,809	693,945	1,573,759
	1980	20,677	344,664	268,753	87,850	721,944	528,710	1,105,515
	1979	20,654	272,397	203,639	57,814	554,504	443,024	682,280
	1978	26,441	199,878	150,667	65,439	442,425	(§)	(§)

* 1978 based on completed costs reported to the U.S. FERC by fiscal year; 1979-1982 by calendar year. 1983-88 based on FERC construction-permit applications, by fiscal year.
† Involves a river crossing. § One report only.

Table 5

Current compressor-station costs

Location*	Horsepower	Equipment & material	Labor	Land	Misc.†	Total	$/hp
		$					
Massachusetts	200	354,000	447,300	108,000	304,624	1,213,924	6,070
Texas	750	23,350	39,000	–	32,200	94,550	126
New York	1,000	1,555,000	1,374,300	320,000	1,098,122	4,342,422	4,347
Pennsylvania§	1,000	1,595,000	400,000	10,000	384,151	2,389,151	2,389
New York§	1,200	1,680,300	1,001,500	18,000	973,862	3,673,662	3,061
New York§	1,350	2,499,400	1,629,700	17,500	1,493,000	5,639,600	4,177
Pennsylvania	1,350	1,355,828	505,903	–	359,979	2,221,710	1,646
New York§	1,800	2,425,800	1,689,800	22,100	1,490,204	5,627,904	2,127
Massachusetts§	2,000	3,042,000	1,939,900	17,000	1,810,413	6,809,313	3,405
New York§	2,250	2,731,100	1,749,900	7,700	1,591,137	6,079,837	2,702
Ohio§	2,400	3,556,600	3,315,800	15,000	1,638,619	8,526,019	3,553
New York	2,500	3,336,300	1,683,800	10,200	1,746,739	6,777,039	2,711
Massachusetts§	2,550	2,104,027	1,390,927	32,055	1,255,900	4,782,909	1,876
Pennsylvania	2,700	2,063,652	633,442	–	539,858	3,236,952	1,199
Pennsylvania§	2,700	3,175,300	1,580,200	7,800	1,669,283	6,432,583	2,382
Tennessee§	2,700	3,281,000	1,635,300	37,400	1,718,417	6,672,117	2,471
Pennsylvania	3,165	2,758,800	1,622,800	18,800	1,566,611	5,967,011	1,885
Pennsylvania	3,200	2,614,000	1,076,800	–	665,239	4,356,039	1,361
New York	3,500	3,092,600	1,805,500	131,000	1,463,370	6,492,470	1,855
New York§	3,500	4,187,300	2,835,700	14,000	2,373,763	9,410,763	2,686
Pennsylvania	4,000	3,448,000	1,245,500	–	1,776,267	6,469,767	1,617
Oklahoma	4,000	2,549,000	1,137,000	73,000	458,033	4,217,033	1,054
Missouri	4,250	2,203,000	430,000	–	319,033	2,952,033	695
Kentucky§	4,300	4,622,500	2,227,300	8,200	2,321,029	9,179,029	2,135
New York§	4,300	4,859,200	2,447,300	23,200	2,458,210	9,787,910	2,276
New York	4,500	3,352,400	1.976,400	474,000	1,896,596	7,700,396	1,711
Pennsylvania	4,800	4,042,000	4,509,000	34,000	931,026	9,516,026	1,983
New York§	5,300	5,107,400	2,925,700	14,400	2,664,856	10,712,356	2,021
New Jersey§	5,500	3,365,000	3,045,000	110,000	1,972,103	8,492,103	1,544
New Jersey§	5,500	3,300,000	2,935,000	105,000	1,800,217	8,140,217	1,480
New York§	5,750	5,243,200	2,494,400	40,300	2,588,263	10,366,163	1,803
Pennsylvania	5,800	3,260,141	1,345,376	–	1,454,109	6,059,626	1,045
Indiana	6,000	4,800,000	4,000,000	601,560	1,737,840	11,139,400	1,857
Pennsylvania§	6,000	5,800,000	2,000,000	20,000	1,628,398	9,448,398	1,575
New York§	6,600	6,160,600	2,518,000	26,400	2,853,839	11,558,839	1,751
North Dakota	8,950	3,522,760	74,125	37,000	598,340	4,905,225	617
New Jersey	8,000	7,116,500	2,029,500	–	2,276,144	11,422,144	1,428
New York	8,100	5,831,000	3,000,000	200,000	2,599,137	11,630,137	1,436
New York	8,400	6,166,000	3,000,000	220,000	2,681,244	12,067,244	1,437
Wyoming	10,600	4,629,000	2,100,000	150,000	1,729,677	8,608,677	812
Utah	10,600	4,629,000	2,100,000	150,000	1,487,405	8,366,405	789
Pennsylvania	11,000	4,817,000	2,673,000	25,000	892,083	8,407,083	764
Pennsylvania	11,000	7,611,000	4,802,000	115,000	1,486,139	14,014,139	1,274
Pennsylvania	11,000	7,797,000	4,964,000	115,000	1,437,219	14,313,219	1,301
Ohio	12,000	5,772,000	1,243,000	156,000	3,932,000	11,109,000	926
Ohio	12,000	5,803,000	1,500,000	160,000	3,759,585	11,222,585	935
Kentucky	12,000	1,862,300	75,900	–	482,810	2,421,010	277
Pennsylvania§	12,500	4,366,000	1,361,500	–	1,474,695	7,202,195	576
Connecticut	12,600	7,490,000	4,950,000	1,445,000	3,078,514	16,963,514	1,394
Connecticut	12,600	7,150,000	4,285,000	1,580,000	3,251,931	16,266,931	1,291
New Jersey	12,600	7,625,000	5,050,000	2,275,000	3,862,732	18,812,732	1,493
New York§	12,600	6,785,000	3,985,000	230,000	2,928,898	12,928,898	1,104
New York§	12,600	6,095,000	3,585,000	115,000	2,586,244	12,381,244	983
New York§	12,600	6,420,000	3,505,000	200,000	2,677,843	12,802,843	1,016
New York§	12,600	5,735,000	3,075,000	100,000	2,350,132	11,260,132	894
Florida	13,500	10,109,000	1,843,000	150,000	5,150,769	17,252,769	1,278
Pennsylvania	13,500	11,004,667	4,301,000	–	2,786,388	18,092,055	1,340
California	15,500	6,078,000	2,210,000	150,000	1,758,783	10,196,783	641
Nevada	15,900	6,078,000	2,210,000	150,000	1,824,533	10,262,533	645
Pennsylvania	22,000	12,776,000	8,429,000	220,000	2,391,245	23,816,245	1,083
Pennsylvania	22,000	12,778,000	8,429,000	220,000	2,393,031	23,820,031	1,083
Alabama	24,000	12,464,000	1,734,000	150,000	6,918,665	21,266,665	886
Iowa-Illinois	192,000	40,428,000	108,113,000	4,888.296	44,752,246	198,181,542	1,032
Total-all projects	**880,565**	**338,483,025**	**258,899,573**	**15,517,911**	**184,573,742**	**777,474,251**	**6,400**
1987–report total	**234,730**	**180,087,350**	**75,320,480**	**4,374,000**	**52,880,838**	**292,852,888**	**1,247**

Source: U.S. FERC construction-permit applications, July 1, 1987, to June 30, 1988. * All projects onshore. † Generally includes engineering, supervision, surveying, interest, administration & overheads, contingencies, Afudc, and FERC fees. § Additions.

Investment by the five products pipeline companies was $2,890.7 million at the end of 1987 compared with $2,840 at the end of 1986, a slight increase of $50.7 million (1.8%).

Fig. 1 illustrates the investment split in the crude-oil and products pipeline companies. As shown, the major investment is in pipeline construction: 40.3% for crude-oil pipelines and 38.8% for products pipelines.

Line pipe and fittings account for slightly less than 30% for both crude-oil and products pipeline investment, while pump stations and equipment account for 20.4% of the investment in crude-oil pipelines and 17.5% for products pipelines.

Construction activity

As Fig. 1 shows, the costs of line pipe and fittings and of laying pipelines make up roughly 70% of the cost of a pipeline system. These elements of pipeline construction costs have risen very little for the past few years, after rapidly increasing before 1982.

Cost trends. Table 4 lists a 10-year land-construction cost trend for natural-gas pipelines with diameters ranging from 8 to 36 in. The table's data are based on a mix of actual costs of completed pipeline construction and projected costs filed under CP dockets with the FERC.

As the table reflects, the average cost per mile for any given diameter may fluctuate from one year to the next as projects' costs are affected by geographic location, terrain, popula-

Table 6

Completed compressor-station costs—1985*

Location†	Number of units	Total horsepower	Cost, $ Equipment & material	Labor	Engineering & supv.	Misc.§	Total cost	$/hp
LAND								
New reciprocating-unit stations—new								
Texas (F)	1	87	13,550	19,387	–	6,938	39,885	458
Colorado (F)	1	180	152,489	29,484	–	5,692	187,665	1,043
Kansas (F)	2	540	438,911	24,176	–	12,883	475,970	881
Kansas (F)	3	720	540,180	63,863	–	35,877	639,920	889
Kansas (F)	3	720	545,641	66,586	–	42,850	655,077	190
Louisiana (F)	1	1,100	971,340	385,693	–	222,214	1,399,247	1,277
Oklahoma (F)	2	1,750	418,873	355,104	–	19,124	793,101	453
Iowa (F)	3	13,800	8,999,336	3,014,519	568,121	462,734	13,044,710	945
Reciprocating-unit stations—additions								
Nebraska (F)	1	60	78,103	5,765	–	2,244	86,112	1,435
Texas (F)	1	530	272,077	148,118	–	94,466	514,661	971
Colorado (F)	1	800	112,684	294,613	–	13,341	420,638	526
Arkansas (F)	3	1,950	1,598,619	426,915	–	268,962	2,294,496	1,177
Louisiana (F)	2	2,200	1,535,736	403,836	–	298,949	2,238,521	1,018
Louisiana (T)	2	2,200	1,566,405	356,302	44,451	282,947	2,250,105	1,023
Ohio (S)	1	5,000	3,226,000	1,065,000	–	1,344,400	5,635,400	1,127
Turbine-driven centrifugal-unit stations—new								
Louisiana (F)	1	1,000	877,264	306,363	–	196,697	1,380,324	1,380
Louisiana (T)	2	6,900	4,389,646	2,758,978	101,573	1,394,212	8,644,409	1,253
Turbine-driven centrifugal-unit stations—additions								
Louisiana (T)	1	3,450	3,392,109	2,460,209	130,000	1,228,293	7,210,611	2,090
Total land	**3**	**42,987**	**28,948,963**	**12,184,921**	**844,145**	**5,932,823**	**47,910,852**	**18,858**
OFFSHORE								
Reciprocating-unit stations—new								
Texas	1	2,700	1,715,338	1,432,236	820,672	234,546	4,202,792	1,557
Louisiana	1	4,000	2,591,634	1,040,104	–	250,336	3,882,074	971
Turbine-driven centrifugal-unit stations—new								
Texas	2	6,600	4,552,705	4,185,685	2,084,674	958,385	11,781,449	1,785
Total offshore	**6**	**13,300**	**8,859,677**	**6,658,025**	**2,905,346**	**1,443,267**	**19,866,315**	**4,313**
Total compressor-station completions—1985	**35**	**56,287**	**37,808,640**	**18,842,946**	**3,749,491**	**7,376,090**	**67,777,167**	**23,169**

Source: U.S. FERC Staff Report, "Cost of Pipeline and Compressor Station under Natural Gas Act Section 7(c) for the Years 1982 through 1985." * Reflects costs for projects completed in 1984, the most recent year for which data are available. † T = transmission station; F = field station; S = storage station. § Generally includes interest during construction, overheads, land, ROW, damages, contingencies, and other costs.

tion density, or other factors.

The cost-per-mile trends from 1986 to 1987 are down, with four of seven diameter classifications showing decreases. These are for 8, 16, 20, and 36-in. categories.

Yearly fluctuations in these figures are illustrated in construction figures for a 12-in. pipeline. These had leaped between 1984 and 1985 by 90% but fell last year by more than 30%.

For the period reported on in this year's report, however, the total average cost-per-mile for a 12-in. pipeline jumped again, this time by $159,259/mile or 47.3%.

More plans, more miles. Table 2 lists 129 land-pipeline construction projects and 3 offshore for a total of 132, a 24.5% increase over 106 projects (104 land, 2 offshore) reported in last year's Pipeline Economics Report (OGJ, Nov. 23, 1987, p. 33). Projects reported on for 1986 had shown a 14% jump over those reported the year before.

Land projects proposed during the period surveyed represent 5,118.45 miles of pipeline at an estimated price tag of more than $3.3 billion, and the offshore pipeline projects represent 401.3 miles of pipeline with an estimated price tag of just more than $303 million.

Total estimated costs for these projects, land and offshore, reach more than $3.6 billion.

Total costs of projects surveyed in last year's Pipeline Economics Report ran slightly more than $923 million

Top 10 interstate liquids pipelines—1987

	Company	Mileage*	Company	Trunkline traffic, million bbl-miles	Company	Income, $1,000
1	Amoco Pipeline Co.	12,267	Colonial Pipeline Co.	657,749	Sohio Alaska Pipe Line Co.	355,699
2	Mobile Pipeline Co.	9,949	Lakehead Pipeline Co. Inc.	341,786	Exxon Pipeline Corp.	322,622
3	Exxon Pipeline Co.	†9,456	Sohio Alaska Pipe Line Co.	193,139	ARCO Pipe Line Co.	287,089
4	Chevron Pipe Line Co.	8,130	Exxon Pipeline Co.	169,225	BP Pipelines Inc.	195,725
5	Conoco Pipeline Co.	7,642	ARCO Pipe Line Co.	162,002	Colonial Pipeline Co.	142,842
6	Shell Pipeline Line Corp.	7,235	Amoco Pipeline Co.	129,115	Amoco Pipeline Co.	87,374
7	Mid-America Pipeline Co.	§7,055	Plantation Pipe Line Co.	121,422	Mobile Pipeline Co.	71,931
8	ARCO Pipe Line Co.	†6,893	Explorer Pipeline Co.	120,714	Chevron Pipe Line Co.	61,892
9	Williams Pipe Line Co.	6,752	Shell Pipe Line Corp.	112,265	Shell Pipe Line Corp.	60,520
10	Phillips Pipe Line Co.	6,183	BP Pipelines Inc.	97,458	Lakehead Pipeline Co. Inc.	50,977
Total		**80,744**		**2,104,875**		**1,636,671**
Part of all companies, %		**48.1**		**80.1**		**86.1**
1985 totals		**81,140**		**2,151,528**		**1,283,788**

Source: U.S. FERC Form 6: Annual Report of Oil Pipeline Companies, Dec. 31, 1987. *C = mostly or exclusively crude oil; P = mostly or exclusively product. †Includes 818 miles for Trans-Alaska Pipeline; to avoid duplication, the total includes 818 miles only once. §Excludes 1,097 miles of ammonia pipelines.

Table 7

Natural-gas pipeline transmission expenses*

	Expenses, $ 1985-majors†	Expenses, $ 1986-majors§	Cost/mile, $ 1985-majors†	Cost/mile, $ 1986-majors§	Cost/MMcf sold, $ 1985 majors†	Cost/MMcf sold, $ 1986-majors§
Operation expenses						
Supervision and engineering	141,111,223	159,699,942	534.15	629.59	12.46	20.43
System control and load dispatching	28,003,796	28,679,686	106.00	113.07	2.47	3.67
Communication system expenses	25,198,795	28,265,422	95.39	111.43	2.22	3.52
Compressor station labor and expenses	241,167,595	239,180,275	912.90	942.93	21.29	30.60
Gas for compressor station fuel	748,735,039	532,572,604	2,834.21	2,099.59	66.09	68.14
Other fuel and power for compressor stations	62,883,011	46,066,937	238.03	181.61	5.55	5.89
Mains	194,353,906	182,900,300	735.69	721.06	17.16	23.40
Measuring and regulating station expenses	70,192,395	62,517,614	265.70	246.47	6.20	8,00
Transmission and compression of gas by others	1,472,161,326	1,267,266,607	5,572.61	4,996.01	129.95	162.13
Other transmission expenses	47,009,813	36,206,154	177.95	142.74	4.15	4.63
Rents	17,089,546	17,142,978	64.69	67.68	1.51	2.18
Total operation expenses	**3,047,906,445**	**2,597,080,519**	**11,537.32**	**10,238.66**	**269.05**	**332.27**
Maintenance expenses						
Supervision and engineering	38,445,814	35,545,963	145.57	140.14	3.39	4.55
Structures and improvements	26,126,983	30,638,479	98.90	120.79	2.31	3.92
Mains	90,064,519	93,717,959	340.92	369.47	7.95	11.99
Compressor station equipment	174,091,277	197,872,245	658.99	780.08	15.37	25.32
Measuring and regulating station equipment	13,635,384	12,539,338	51.61	49.43	1.20	1.60
Communication equipment	13,164,377	13,913,234	49.83	54.85	1.16	1.78
Other equipment	4,216,143	3,138,461	15.96	12.37	0.37	0.40
Total maintenance expenses	**359,754,497**	**387,365,679**	**1,361.78**	**1,527.13**	**31.75**	**49.56**
Total transmission expenses	**$3,407,660,942**	**$2,984,446,198**	**$12,899.10**	**$11,765.79**	**$300.80**	**$381.83**
Total miles of transmission pipeline	**264,178**	**253,656**				
Total natural gas sold, MMcf	**11,328,465**	**7,816,250**				

Source: Statistics of Interstate Natural Gas Pipeline Companies—1985 & 1986. U.S. Department of Energy. * U.S. interstate pipelines for calendar years 1985 & 1986. † 45 of 137 companies filing Form 2's or 2A's with the U.S. Federal Energy Regulatory Commission; majors are companies whose combined gas sold for resale and gas transported or stored for a fee exceed 50 bcf (at 14.7 psi; 60° F.) in each of the 3 previous calendar years. §44 of 135 companies filing Form 2's and 2A's with the U.S. FERC for 1986; majors defined in previous note and in U.S. FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011, effective Feb. 2, 1985, beginning with the 1984 reporting year (OGJ, Nov. 25, 1985, p. 80).

Top 10 U.S. gas-pipeline companies—1987

Company	Mileage	Company	Sales, MMcf	Company	Net income, $1,000
1. Northern Natural, Div. of Enron	23,540	Texas Eastern Transmission Corp.	651,606	El Paso Natural Gas Co.	200,338
2. El Paso Natural Gas Co.	21,823	Tennessee Gas Pipeline Co.	421,218	ANR Pipeline Co.	200,301
3. Columbia Gas Transmission Corp.	18,820	Northern Natural, Div. of Enron	414,179	Texas Eastern Transmission Co.	136,483
4. Tennessee Gas Pipeline Co.	14,106	Columbia Gas Transmission Corp.	409,561	Natural Gas Pipeline Co. of America	129,468
5. Arkla Inc.	13,430	Transcontinental Gas Pipeline Corp.	396,851	Panhandle Eastern Pipe Line Co.	128,095
6. Natural Gas Pipeline Co. of America	12,652	Pacific Gas Transmission System	358,401	Southern Natural Gas Co.	89,676
7. Panhandle Eastern Pipe Line Co.	12,626	El Paso Natural Gas Co.	288,865	Colorado Interstate Gas	69,284
8. KN Energy	12,250	Florida Gas Transmission Co.	239,216	Texas Gas Transmission Corp.	68,559
9. ANR Pipeline Co.	11,681	Enserch Corp.	227,585	Northern Border Pipeline Co.	60,861
10. Transcontinental Gas Pipeline Corp.	10,586	Northwest Pipeline Co.	201,263	Illinois-Iowa Gas and Electric Co.	60,590
					1,173,825
Totals	**151,514**		**3,608,745**		**105.0**
Part of majors, %	**80.0**		**57.6**		**86.9**
Part of all companies, %	**54.1**		**44.0**		**1,283,798**
1986 totals	**150,940**		**4,273,273**		

Source: U.S. FERC Form 2: Annual Report for Major Natural Gas Companies, Dec. 31, 1987.

land and $3.4 million for offshore.

All projects proposed during the period covered (July 1, 1987, to June 30) represent 5,519.75 miles, an increase over mileage proposed for the period immediately preceding of 4,218.24 or 324%.

Examination of proposed projects for the period covered reveals the extent to which U.S. natural-gas pipeline companies want to go after the anticipated heavy gas demand in the U.S. Northeast.

Of the 129 land projects, 94 are for locations in states ranging northeast from West Virginia and Pennsylvania. The projects consist almost entirely of looping spreads for expansion projects; many of the proposals are for lengthy transmission systems. The approximately 1,900 miles in these projects make up more than 37% of the total land mileage proposed.

Many of the remaining projects are for pipelines to serve the California thermal EOR market for steam generation.

Cost trends, components. Cost-per-mile figures may reveal more about cost trends than aggregate costs.

For proposed U.S. gas-pipeline projects in the 1987-88 period surveyed, the average land cost per mile was $657,388, compared with $707,253 for the 1986-87 period, an insignificant decrease of less than 1%.

For offshore projects, the 1987-88 figure was $755,345/mile, compared with $825,395/mile for 1986-87, a decline of 8.5%.

Combined land and offshore projects show an average cost of $664,509/mile for this year's coverage; for the 1986-87 period, the figure was $707,634/mile.

Analyses of the four major categories of pipeline construction costs—material, labor, right-of-way and damages, and miscellaneous—can also indicate trends within each group.

"Miscellaneous" generally includes engineering, supervision, contingencies, allowances for funds used during construction, administration and overheads, and FERC filing fees.

For the 132 projects surveyed for the 1987-88 period covered in this report, cost-per-mile data for the four categories are as follows:

- Material—Land, $217,079/mile;

ONSHORE PIPELINE PROJECTS

2 miles of 30-in. loop, Massachusetts

Item	Cost
Right-of-way	$98,000
MATERIAL	
30-in. OD X 0.317-in. W.T. Gr. X60 pipe	394,200
30-in. OD X 0.380-W.T. Gr. X60 pipe	2,800
Pipe coating	69,800
Station valve assembly	63,200
Mainline valve assembly	63,300
Miscellaneous and freight	39,300
INSTALLATION	
Lay, string, and test	1,182,800
Road crossing	17,400
Station valve assembly	42,300
Mainline valve assembly	43,200
Erosion control	16,600
Mulch	18,800
Test manifold	24,800
Line crossing	5,000
Concrete coating	19,200
Concrete coating	[illegible],900
Padding	[illegible]700
Padding	[illegible],000
Performance bond	13,200
X-ray	14,400
Load gas	8,800
Supervision and inspection	44,000
Miscellaneous	413,904
Total	**$2,957,940**
Cost/mile	**$1,478,970**

77 miles of 20 in., Utah

Item	Cost
Right-of-way	$353,8[illegible]
Material	8,671,[illegible]
Block valve facilities	226,900
Metering, control, and pigging facilities	1,147,600
Installation	6,170,200
Miscellaneous	
Environmental analysis	133,500
Engineering & inspection	870,800
Administrative, general	811,200
Afudc	576,700
Total	**$18,962,000**
Cost/mile	**$246,260**

- Material–Land, $217,079/mile; offshore, $377,663/mile; total, $228,753/mile.
- Labor–Land, $281,637/mile; offshore, $209,634/mile; total, $276,402/mile.
- R.O.W. and damages–Land, $40,213/mile; offshore, $12/mile; total, $37,290/mile.
- Miscellaneous–Land, $118,459/mile; offshore, $168,036/mile; total, $122,064/mile.

Table 2 lists proposed pipelines in order of increasing diameter and increasing lengths within each pipeline diameter. The average cost per mile for the projects shows no clear-cut trend related either to length or geographic area.

In general, however, the cost per mile within a given diameter indicates that the longer the pipeline, the lower the cost per mile for construction.

Nonetheless, road, highway, and river crossings and marshy or rocky terrain each strongly affects pipeline construction costs.

Fig. 2, derived from Table 2 for land and offshore pipelines, shows the major cost-component split for pipeline construction cost.

Material and labor are shown to make up more than 75% of the cost of constructing land pipelines and more than 77% of the cost for offshore pipelines.

Fig. 3 plots the average pipeline construction cost for land and offshore gas-pipeline construction projects listed in Table 2.

Compressor stations. Compressor-station costs make up another major cost element of natural-gas pipelines. Table 5 lists 63 land and no offshore compressor-station projects. FERC applications for these projects cover the same period as for pipelines: July 1, 1987, to June 30.

53.5 miles of 30 in., Wyoming—California

Item	Cost
Rights-of-way	$18,409,410
MATERIAL	
Pipe	102,324,930
Pipe coating	7,827,369
Mainline valve assembly	1,211,000
Miscellaneous	5,568,165
Taxes, freight	18,709,034
INSTALLATION	
Lay, string, and test	107,839,512
Install valves	210,000
X-ray	2,995,542
Hydrostatic test	5,991,084
Miscellaneous	5,851,807
Miscellaneous	64,472,402
Total	**$32,653,762**
Cost/mile	**$616,821**

76 miles of 30 in., Florida ("Sunshine")

Item	Cost
Rights-of-way, damages	$4,864,000
Pipe, valves, fittings, other materials	27,374,000
Installation	12,262,000
Miscellaneous	
Survey, mapping	440,000
Engineering, inspection, other	1,296,000
Omissions, contingencies	2,312,000
Administrative overheads	1,942,000
Afudc	4,657,000
Line pack (est.)	259,974
FERC fees (est.)	1,755
Total	**$55,426,729**
Cost/mile	**729,299**

371.3 miles of 36 in., Iowa—Illinois

Item	Cost
Rights-of-way	$8,208,648
MATERIAL	
36-in. OD pipe	127,427,000
River crossing	1,717,000
INSTALLATION	
Contract	111 141,000
River crossing	9,372,000
Miscellaneous	75,149,998
Total	**$333,014,646**
Cost/mile	**$896,888**

87.5 miles of 30 in., Alabama—Mississippi

Item	Cost
Right-of-way	2,560,000
MATERIAL	
30-in. OD X 0.385-in. W.T. Gr. X65 pipe	19,463,400
30-in. OD X 0.462-in. W.T. Gr. X65 pipe	518,000
30-in. OD X 0.554-in. W.T. Gr. X65 pipe	154,600
Pipe coating	3,187,800
Casing	20,800
Station tie-in assembly	306,700
Mainline valve assembly	339,500
Plant tie-in assembly	170,900
Miscellaneous, tax, and freight	3,304,800
INSTALLATION	
Lay, string, and test	14,919,100
Casing	116,000
Road crossing	1,027,200
Station tie-in assembly	184,600
Mainline valve assembly	204,500
Plant tie-in assembly	102,900
Erosion control	43,800
Mulch	80,000
Test manifold	67,[illegible]00
River crossing	1,987,[illegible]00
Line crossing	30,000
Concrete coating—field formed	480,500
Concrete coating—field formed	131,100
Performance Bond	105,000
X-ray	656,300
Load gas	488,200
MISCELLANEOUS	
Preliminary survey	271,300
Design, drafting	2,893,500
Supervision, inspection	1,062,000
Contingencies	1,030,500
Administrative, general	4,184,500
Undistributed cost	1,201,800
Afudc	3,677,879
FERC fees	19,217
Total	**$64,991,068**
Cost/mile	**$742,755**

Onshore pipeline projects (continued)

0.48 miles of 24-in. loop river crossing, Tennessee

Item	Cost
Right-of-way	40,000
MATERIAL	
24-in. OD X 0.500-W.T. Grade B ERW pipe	178,500
24-in. ball valve, ANSI 600 lb	176,000
6-in. plug valve, ANSI 600 lb	22,800
4-in. plug valve, ANSI 600 lb	11,200
INSTALLATION	
Lay and bury	1,071,000
Pipeline tie-ins	50,000
Road crossings	56,000
Testing	10,000
X-ray	15,000
MISCELLANEOUS	
Hydrographic survey and inspection	50,000
General supervision, engineering	70,000
Field inspection	136,800
Contingencies	98,000
Miscellaneous and sales tax	73,500
Total	**2,058,800**
Cost/mile	**4,289,167**

4 miles of 30 in., Alabama (Sunshine)

Item	Cost
Right-of-way and damages	$256,000
Pipe, valves, fittings, other miscellaneous materials	1,394,000
Installation	768,000
Miscellaneous	
Survey, mapping	52,000
Contingencies	128,000
Administrative overheads	108,000
Afudc	260,000
Line pack (est.)	9,388
FERC fees (est.)	98
Total	**$3,072,486**
Cost/mile	**$768,122**

Costs for new land compressor stations range from $126/hp for a 750-hp station in Texas to $4,347/hp for a 1,000-hp station in New York. Cost-per-horsepower figures show no particular correlation with compressor-station size or location.

Fig. 4 shows the cost split for land compressor stations based on data in Table 5.

Final costs. One factor in compressor-station costs is the type of driver specified.

28.1 miles of 30-in. loop, New York

Item	Cost
Right-of-way	$2,023,000
MATERIAL	
30-in. OD X 0.500-in. W.T. Gr. X60 pipe	7,312,300
30-in. OD X 0.600-in. W.T. Gr. X60 pipe	634,000
Pipe coating	949,800
Casing	41,700
Mainline valve assembly w/tie-over	289,500
End-of-line piping	36,300
Miscellaneous, tax, and freight	1,495,000
INSTALLATION	
Lay, string, and test	8,428,600
Casing	335,800
Road crossing	437,900
Mainline valve assembly w/tie-over	196,200
End-of-line pipeline	24,300
Barge canal crossing	950,400
Erosion control	45,000
Mulch	226,000
Test manifold	173,600
River crossing	266,400
Line crossing	25,000
Concrete coating	130,300
Concrete coating	74,400
Padding	85,200
Padding	265,500
Performance bond	68,000
X-ray	196,700
Load gas	170,200
Supervision, inspection	330,000
Miscellaneous	6,863,617
Total	**$31,745,317**
Cost/mile	**$1,129,727**

Table 6 is a compilation from the most recent FERC staff report on costs of compressor stations completed in 1985.

The table is broken down by type of prime mover.

Of the 21 compressor stations completed in 1985 and their costs reported to the FERC, eight of the new stations were land reciprocating-unit stations.

Two new reciprocating stations were completed offshore.

For the period, two new turbine-driven centrifugal units on land were reported.

Of compressor-station additions on land, seven were reciprocating units; one turbine-driven centrifugal addition was reported.

Fig. 5, taken from FERC staff reports for 1981-84 and 1982-85, shows the natural-gas pipeline mileage and compressor-station horsepower installed for 1977 through 1985.

The curves indicate the continuing flat offshore-pipeline construction status, while land-pipeline construction, after a precipitous drop between 1982 and 1983, would seem to be leveling off by 1985.

Another FERC staff report expected next month or during the first quarter of 1989 will indicate completed-construction trends through 1986.

6 miles of 20 in., Wyoming

Item	Cost
Right-of-way	199,560
MATERIAL	
Pipe	467,523
Pipe coating	37,146
Mainline valve assembly	19,600
Miscellaneous	26,213
Taxes, freight	88,077
INSTALLATION	
Lay, string, test	779,328
Install valves	6,000
X-ray	32,472
Hydrostatic test	64,944
Miscellaneous	44,137
Miscellaneous	493,810
Total	**$2,258,811**
Cost/mile	**$376,469**

30.8 miles of 30 in., Wyoming

Item	Cost
Right-of-way	$1,024,408
MATERIAL	
Pipe	5,552,220
Pipe coating	277,077
Mainline valve assembly	103,800
Miscellaneous	296,655
Taxes, freight	996,760
INSTALLATION	
Lay, string, and test	6,000,826
Install valves	18,000
X-ray	166,690
Hydrostatic test	333,379
Miscellaneous	325,945
Miscellaneous	4,057,015
Total	**$19,152,774**
Cost/mile $621,843	

3.77 miles of 6-in. replacement, Louisiana

Item	Cost
Right of way and cost of acquisition	60,300
MATERIAL	
Pipe: 6 5/8-in. OD X 0.28-in. WT API-5L	132,495
Enamel coating	25,374
Miscellaneous material	6,700
Installation	206,000
Surveying, mapping	10,000
Engineering, inspection	113,500
General overhead	16,631
FERC fee	15,000
Total	**$586,000**
Cost/mile	**$155,438**

Effect of size. Another element affecting the capital expenditures for pipeline construction is the distribution of the diameter and mileage.

Fig. 6's curves reflect the cumulative percentage of mileage for pipeline diameters for 4 in. to 42 in. from July 1, 1986, to June 30, 1987, and for

Onshore pipeline projects (continued)

24.97 miles of 30 in., Pennsylvania

Item	Cost
Right-of-way	$1,013,800
Line pipe, valves, and fittings	7,300,300
Cathodic protection	27,600
River crossings	39,500
Road, railroad crossings	288,100
Installation	11,49,900
Miscellaneous	
Engineering, surveying, and inspection	664,200
Archaeological, environmental studies	174,700
Gas lost in construction, and line pack	275,900
Pennsylvania sales tax	142,600
Contingency	1,574,300
Afudc	739,100
Ferc filing fee	15,000
Total	23,305,000
Cost/mile	$933,320

24.5 miles of 30 in., Alabama (Gateway)

Item	Cost
Right-of-way	$436,200
MATERIAL	
30-in. OD X 0.328-in. W.T. API 5L Gr. X65	4,882,181
30-in. OD X 0.406-in. W.T. API 5L Gr. X65	398,591
30-in. O.D. X 0.500-in. W.T. AP I 5L Gr. X60	211,599
Enamel coating	767,772
Meter and regulator facilties	610,491
Miscellaneous	1,575,587
Installation	4,377,500
Engineering	70,150
Adminstrative & field engr. & inspection	1,661,651
General overhead	973,498
Interest	767,780
FERC fee	26,637
Total	$16,759,637
Cost/mile	$684,067

10.8 miles of 36-in. loop, Pennsylvania

Item	Cost
Right-of-way	$259,000
MATERIAL	
36-in. OD X 0.375-in. W.T. Gr. X60 pipe	1,175,300
36-in. OD X 0.450-in. W.T. Gr. X60 pipe	1,822,100
30-in. OD X 0.540-in. W.T. Gr. X60 pipe	171,400
Pipe coating	456,800
Casing	149,500
Station valve asembly	76,800
Mainline valve assembly	145,200
Tie-over piping	33,200
Miscellaneous and freight	310,500
INSTALLATION	
Lay, string, and test	3,728,500
Casing	569,700
Road crossing	175,800
Station valve assembly	51,500
Mainline valve assembly	96,800
Tie-over piping	24,900
Erosion control	17,300
Mulch	98,300
Test manifold	151,800
Lake crossing	720,000
River crossing	171,000
Line crossing	28,000
Concrete coating—field formed	226,600
Concrete coating—field formed	66,800
Padding	45,400
Padding	94,200
Performance bond	41,500
X-ray	85,300
Load gas	68,100
Miscellaneous	3,133,151
Total	$14,194,451
Cost/mile	$1,314,301

27 miles of 24 in., Pennsylvania

Item	Cost
Rights-of-way, damages	595,700
Line pipe, valves, fittings	4,688700
Cathodic protection	36,800
Road crossings	125,500
Installation	8,030,300
MISCELLANEOUS	
Engineering, surveying, inspection	542,200
Archaeological, environmental studies	15,000
Filing fees, gas lost in construction, and line pack	174,400
Pennsylvania sales tax	51,500
New York sales tax	3659,900
Afudc	680,000
Total	15,300,000
Cost/mile	566,666

OFFSHORE PIPELINE PROJECT

388 miles of 30 in., Alabama—Florida (Sunshine)

Item	Cost
Pipe, valves, fittings, other miscellaneous materials	$145,909,000
Installation	78,324,000
Miscellaneous	
Survey, mapping	850,000
Engineering, inspection, other	17,196,000
Omissions, contingencies	12,114,000
Administrative overheads	10,176,000
Afudc	24,499,000
Line pack (est.)	1,366,530
FERC fees (est.)	9,225
Total	$290,443,755
Cost/mile	$748,566

diameters of 3 in. to 42 in. from July 1, 1987, to June 30.

For the 1986-87 period, slightly less than 45% of the pipeline construction proposed was for diameters of 24, 30, 36, and 42 in.

For the more recent period, however, 71% of the construction proposed was for diameters of 24, 26, 30, 36, and 42 in.

As an aid in determining the detailed costs for each major element in pipeline and compressor-station construction for the pipelines and compressor stations, several tables covering specific projects are included in this report (pp. 52-56).

These give detailed cost breakdown for each major component in a construction-cost estimate.

They cover cost information from the FERC applications for the 1987-88 period surveyed and listed in Table 2.

These detailed tables represent both a variety of land geographic locations in the U.S. and pipeline and compressor stations for both land and offshore facilities.

Operating costs. Once a natural-gas pipeline is laid and compressor stations constructed, operating costs become the next consideration.

As an aid in estimating this element, transmission expenses for interstate gas pipelines for 1985 and 1986 have been included (Table 7).

Its data are based on 264,178 miles of pipeline operated and 11,328,495 MMcf sold for 1985 majors and on 253,656 miles of pipeline operated and 7,816,259 MMcf of gas sold for 1986 majors.

- The highest component of transmission-operating expenses is transmission and compression of gas by others: for majors in 1985, this component was $5,573/mile or $130/MMcf; for majors in 1986, this component was $4,996/mile or $162/MMcf.
- The second highest cost component of transmission-operating expense is gas for compressor-station fuel: for majors in 1985, that came to $2,834/mile or $66/MMcf; for majors during 1986, it came to $2,100/mile or $68/MMcf.

COMPRESSOR FACILITIES

Install 4,000 hp, Pennsylvania

Item	Cost
Material	$3,448,000
Installation	1,245,500
MISCELLANEOUS	
Engineering, field supervision	856,390
Contingency	555,473
Afudc	294,637
Total	**$6,400,000**
Cost/hp	**$1,600**

Install 24,000-hp compressor, Alabama (Sunshine)

Item	Cost
Land	$50,000
Site preparation	100,000
Material	12,464,000
Installation	1,734,000
Miscellaneous	
Electrical, communications	1,971,000
Engineering, inspection, other	1,035,000
Omissions, contingencies	868,000
Administrative overheads	729,000
Afudc	2,215,000
Other (est.)	99,990
FERC fees (est.)	675
Total	**$21,266,665**
Cost/hp	**$886**

Add 4,300-hp reciprocating compressor, Kentucky

Item	Cost
Site improvement	8,200
MATERIAL	
Reciprocating engine	2,565,000
HP gas pipe, valves, fittings	597,300
Station pipe, valves, fittings	233,000
Concrete foundations	125,400
Tankage, pumps	27,200
Supervisory equipment	126,500
Fire detection, protection	15,000
Electrical	127,000
J.W. & C.W. coolers	140,000
Fuel gas skid	60,000
Hot-water heating equipment	7,300
Miscellaneous, tax, and freight	370,100
INSTALLATION	
Contract	[illegible]99,200
Performance bond	18,300
X-ray	10,000
MISCELLANEOUS	
Piping pulsation study	40,000
Design, drafting	377,200
Supervision, inspection	231,000
Contingencies	360,900
Administrative, general	621,900
Undistributed cost	169,800
Miscellaneous	520,229
Total	**$9,179,229**
Cost/hp	**$2,135**

- The highest cost component of maintenance expense covers compressor-station equipment: for majors in 1985, $659/mile or $15/MMcf; for majors in 1986, $780/mile or $25/MMcf.
- The second highest cost component for maintenance is the maintenance of pipelines: for 1985 majors, $341/mile or $8/MMcf; for 1986 majors, $369/mile or $12/MMcf.
- Table 7 indicates that the highest component of transmission expenses for natural-gas pipelines is the operation expense: for 1985 majors, $11,537/mile or $269/MMcf; for 1986 majors, $10,239/mile or $332/MMcf.
- Unit-maintenance expenses for 1985 majors were $1,362/mile or $32/MMcf; for 1986 majors, $1,527/mile or $59/MMcf.
- During 1985, major natural-gas pipeline companies spent almost $3,048 million for operation expenses and nearly $360 million on maintenance.

Total expenditures by 1986 majors for operation and maintenance expenses reached more than $3,407 million.

Total operation expenses for majors in 1986 fell to slightly more than $2,597 million, a drop of almost $451 million (off a sharp 14.8%).

Total maintenance expenses in 1986, on the other hand, rose to more than $387 million, an increase of almost $28 million (7.7%).

Total transmission expenses nonetheless showed a decline between 1985 and 1986. In the latter year, they reached only slightly more than $2,984 million, a drop from 1985 of a little more than $423 million (down a noticeable 12.4%).

- On a unit basis, the total 1985 transmission expense for majors was $12,899/mile or $300/MMcf; for 1986, $11,766/mile or $382/MMcf of gas sold.

Add 2,400-hp reciprocating compressor, Ohio

Item	Cost
Site improvement	$15,000
MATERIAL	
Reciprocating engine	1,600,900
HP gas pipe, valves, fittings	566,100
Station pipe, valves, fittings	233,000
Concrete foundations	144,300
Tankage, pumps	10,700
Supervisory equipment	19,000
Fire detection, protection	5,000
Electrical	100,000
J.W. & C.W. coolers	92,000
HP gas filter	67,400
Fuel gas skid	20,000
Hot-water heating equipment	7,300
Miscellaneous, freight	300,400
Buildings	291,400
INSTALLATION	
Contract	2,276,900
Performance bond	18,900
X-ray	20,000
MISCELLANEOUS	
Piping pulsation study	40,000
Design, drafting	308,800
Supervision, inspection	231,000
Contingencies	312,900
Administrative, general	554,200
Undistributed cost	146,700
Miscellaneous	450,019
Total	**$7,931,019**
Cost/hp	**$3,305**

Add 2,700-hp reciprocating compressor, Tennessee

Item	Cost
Site improvement	$37,400
MISCELLANEOUS	
Piping pulsation study	35,000
Design, drafting	259,100
Supervision, inspection	192,50
Contingencies	263,400
Adminstrative and general	466,900
Undistributed cost	123,400
Miscellaneous	378,117
MATERIAL	
Reciprocating engine	1,650,000
HP gas pipe, valves, fittings	291,800
Station pipe, valves, fittings	233,000
Concrete foundations	145,200
Tankage, pumps	35,100
Supervisory equipment	90,000
Fire detection, protection equipment	10,000
Electrical	73,000
J.W. & C.W. coolers	92,000
Fuel gas skid	22,000
Hot-water heating equipment	7,300
Air compressor, 10hp	5,600
Miscellaneous, tax, & freight	319,500
Buildings	306,500
INSTALLATION	
Contract	1,606,300
Performance bond	14,000
X-ray	15,000
Supervision, inspection	192,500
Total	**$6,672,117**
Cost/hp	**$2,471**

LIQUID PIPELINES

	Miles of pipeline				Deliveries, 1,000 bbl			Total trunkline traffic, Million bbl-miles*			Fiscal data, $1,000			
Company	Gathering	Trunk Crude	Trunk Products	Total	Crude	Products	Total	Crude	Products	Total	Carrier property	Change	Operating revenue	Income
Acorn Pipeline Co.	—	—	—	—	149	—	149	—	—	—	3,388	8	43	−153
Air Force Pipeline Co.	—	—	5	5	—	1,375	1,375	—	7	7	353	—	243	37
Algonquin Pipeline Co.	33	51	—	84	702	—	702	23	—	23	2,353	38	580	76
All American Pipeline Co. (new)														
Allegheny Pipeline Co.	—	—	603	603	—	10,777	10,777	—	3,479	3,479	28,399	140	5,253	1,173
Amerada Hess Pipeline Corp.	—	† 818	—	† 818	10,961	—	10,961	8,468	—	8,468	149,545	229	40,685	15,525
American Petrofina Pipeline Co.	—	1,104	—	1,104	33,766	—	33,766	1,340	—	1,340	22,845	190	10,891	3,082
Amoco Pipeline Co.	2,225	7,681	2,361	12,267	349,356	151,597	500,953	119,184	9,931	129,115	567,693	22,765	212,046	87,374
Antelope Pipeline Co. (new)														
ARCO Pipe Line Co.	1,607	† 2,393	2,893	† 6,893	394,967	213,922	608,889	149,909	12,093	162,002	2,412,212	11,323	691,586	287,089
Ashland Pipe Line Co.	501	787	—	1,288	96,698	—	96,698	61,428	—	61,428	102,200	4,761	40,518	9,533
Atlantic Pipeline Corp.	—	11	941	952	49,963	47,229	97,192	§	7,729	7,729	48,627	960	34,612	6,208
Badger Pipe Line Co.	—	—	284	284	—	55,495	55,495	—	3,531	3,531	25,367	—	11,776	2,708
Belle Fourche Pipeline Co.	1,225	729	—	1,954	26,988	—	26,988	3,235	—	3,235	56,131	—	15,150	6,877
Black Lake Pipe Line Co.	—	255	—	255	2,453	—	2,453	454	—	454	10,387	112	989	157
BP Pipelines Inc.	—	† 818	—	† 818	121,846	—	121,846	97,458	—	97,458	1,613,480	2,389	482,069	195,725
Buccaneer Pipe Line Co.	—	2	—	2	379	—	379	§	—	§	176	—	57	−123
Buckeye Pipe Line Co.	—	—	3,419	3,419	—	262,956	262,956	—	33,757	33,757	465,895	9,925	125,716	24,772
Buckeye Pipe Line Co., of Mich. Inc.	—	160	—	160	16,216	6,314	22,530	1,790	151	1,941	40,801	2,738	5,476	− 3
Butte Pipe Line Co.	—	373	—	373	32,048	—	32,048	8,252	—	8,252	18,708	79	9,828	2,578
C&T Pipeline Inc.	—	—	62	62	—	24	24	—	25	25	351	—	61	−963
Calnev Pipe Line Co.	—	—	583	583	—	28,869	28,869	—	5,730	5,730	41,050	2,777	20,120	8,713
Chase Transportation Co.	—	—	716	716	—	15,960	15,960	—	5,678	5,678	38,652	272	9,653	5,945
Chevron Pipe Line Co.	2,006	2,739	3,385	8,130	333,767	243,350	577,117	21,254	42,587	63,841	519,437	15,954	190,438	61,892
Chicap Pipe Line Co.	—	235	—	235	77,544	—	77,544	6,278	—	6,278	33,289	172	6,785	2,768
Chisholm Pipeline Co.	—	—	203	203	—	13,030	13,030	—	2,645	2,645	19,724	43	4,761	1,454
Ciniza Pipe Line Inc.	233	135	11	379	6,811	1,409	8,220	435	16	451	6,710	123	2,965	−159
Citgo Pipe Line Co.	602	875	—	1,477	108,098	138	108,236	4,283	5	4,288	49,253	1,778	18,400	4,379
Cities Service NGL Pipe Line Co.	—	—	106	106	—	4,268	4,268	—	455	455	3,230	—	1,096	353
CKB Petroleum Inc.	—	—	—	—	1,408	—	1,408	73	—	73	4,757	—	3,879	1,423
Clarco Pipeline Co.	90	—	—	90	1,701	—	1,701	—	—	—	3,618	209	467	51
Coastal Pipeline Co.	—	—	—	—	—	13,934	13,934	—	930	930	6,611	6,617	2,603	557
[illegible]G Pipeline Co.	—	—	—	—	1,472	—	1,472	—	—	—	4,144	3	1,639	612
Cochin Pipeline System	—	—	1,197	1,197	—	19,653	19,653	—	18,697	18,697	240,107	27	44,939	23,353
Collins Pipeline Co.	—	124	—	124	—	39,903	39,903	—	4,948	4,948	15,344	—	3,461	469
Colonial Pipeline Co.	—	—	5,206	5,206	—	629,710	629,710	—	657,749	657,749	1,346,429	12,646	495,294	142,842
Con-Dor Pipeline Co. (new)														
Conoco Pipeline Co.	3,966	1,656	2,020	7,642	198,393	53,756	252,149	15,877	9,157	25,034	196,593	6,474	82,384	36,203
Cook Inlet Pipe Line Co.	—	55	—	55	11,439	—	11,439	366	—	366	42,446	99	13,003	3,689
Crown-Rancho Pipe Line Corp.	7	—	—	7	11,633	—	11,633	1,788	—	1,788	2,230	6	1,667	1,184
Diamond Shamrock Refining & Markt. Co.	—	—	622	622	—	19,429	19,429	—	12,681	12,681	34,339	1,949	12,189	3,706
Dixie Pipeline Co.	—	—	1,303	1,303	—	32,885	32,885	—	17,623	17,623	75,632	837	42,030	10,662
Dome Pipeline Corp.	1	8	134	143	—	10,047	10,047	—	153	153	22,715	67	1,511	8,874
El Paso Frontera Corp.	—	—	—	—	370	—	370	40	—	40	1,378	—	590	193
Emerald Pipe Line Corp.	—	—	113	113	—	1,965	1,965	—	169	169	1,430	—	531	252
Endicott Pipeline Co.	—	25	—	25	8,746	—	8,746	218	—	218	54,626	16,571	6,210	3,161
Enron Liquids Pipeline Co.	—	—	1,581	1,581	—	46,966	46,966	—	14,514	14,514	161,329	868	36,107	5,877
Enterprise Pipeline Co.	—	—	98	98	—	4,392	4,392	—	430	430	20,391	202	3,251	538
Enterprise Products Co. of Mississippi	—	—	125	125	—	2,036	2,036	—	255	255	12,136	59	523	2,130
Eureka Pipe Line Co.	771	3	—	774	2,871	—	2,871	1	—	1	15,913	—	7,765	1,358
Explorer Pipeline Co.	—	—	1,096	1,096	—	167,670	167,670	—	120,714	120,714	255,522	1,117	103,234	31,195
Exxon Pipeline Co.	1,891	† 4,986	2,579	† 9,456	435,077	100,547	535,624	162,655	6,570	169,225	2,175,096	6,670	661,047	322,622
Farmland Industries Inc.	629	239	—	868	22,591	—	22,591	544	—	544	10,995	71	3,382	—
Four Corners Pipe Line Co.	282	1,220	14	1,516	117,881	13,908	131,789	10,746	26	10,772	156,602	4,221	41,318	10,752
Frontier Pipeline Co.	—	290	—	290	4,300	—	4,300	1,247	—	1,247	48,849	6	9,869	—
G & T Pipeline Co.	—	50	—	50	203	—	203	4	—	4	5,142	—	574	81
Gulf Central Pipeline Co.	—	—	1,976	1,976	—	10,806	10,806	—	7,556	7,556	126,535	279	21,436	4,283
Hess Pipeline Co.	—	442	—	442	25,182	—	25,182	1,536	—	1,536	45,291	− 56	12,438	3,981
Howell Crude Oil Co.	—	6	—	6	921	—	921	—	—	—	1,313	—	484	894
Interstate Storage & Pipeline Corp.	—	—	23	23	—	2,056	2,056	—	47	47	3,027	33	1,243	232
Jayhawk Pipeline Corp.	770	667	—	1,437	37,604	—	37,604	3,785	—	3,785	26,226	6,496	8,916	1,831
Kaneb Pipe Line Co.	—	—	2,080	2,080	—	48,522	48,522	—	12,912	12,912	106,132	595	34,738	9,290
Kaw Pipe Line Co.	1,396	—	—	1,396	14,648	—	14,648	—	—	—	12,344	411	5,410	886

LIQUID PIPELINES (continued)

	Miles of pipeline				Deliveries, 1,000 bbl			Total trunkline traffic, Million bbl-miles*			Fiscal data, $1,000			
		Trunk												
Company	Gathering	Crude	Products	Total	Crude	Products	Total	Crude	Products	Total	Carrier property	Change	Operating revenue	Income
Kerr-McGee Pipeline Corp.	8	56	—	64	1,495	—	1,495	32	—	32	5,327	246	2,157	1,191
Kiantone Pipeline Corp.§	—	78	—	78	19,693	—	19,693	1,540	—	1,540	9,813	110	4,135	1,500
Koch Pipelines Inc.	923	1,134	1,505	3,562	33,429	55,385	88,814	2,168	24,281	26,449	300,815	26,167	50,084	20,767
Kuparak Pipeline Co.	—	37	—	37	103,241	—	103,241	3,386	—	3,386	126,020	282	63,407	48,036
Lake Charles Pipe Line Co.	—	—	13	13	—	81,989	81,989	—	396	396	10,895	78	4,101	1,380
Lakehead Pipe Line Co. Inc.	—	2,612	—	2,612	438,954	—	438,954	341,786	—	341,786	510,269	13,439	202,120	50,977
Largo Co., The	—	—	—	—	1,144	—	1,144	45	—	45	12,640	- 1	1,687	2,047
Locap Inc.	—	59	—	59	200,372	—	200,372	11,439	—	11,439	120,434	8	18,989	-105
Laurel Pipe Line Co.	—	—	351	351	—	31,005	31,005	—	4,877	4,877	46,154	669	13,251	2,972
Marathon Pipe Line Co.	1,014	1,710	1,462	4,186	345,978	222,138	568,116	49,173	16,229	65,402	350,460	5,000	139,402	39,397
Mark Oil Pipeline Co.	1	—	—	1	269	—	269	§	—	§	923	—	188	- 62
McMoran Pipeline Co.	—	—	—	—	182	—	182	14	—	14	1,761	-158	392	194
Mesa Transmission Co.	—	11	—	11	856	—	856	41	—	41	10,172	—	1,668	153
Mid-America Pipeline Co.	—	19	917,036	917,055	30,415	156,621	187,036	4,157	45,936	50,093	478,703	13,832	125,443	49,332
Mid-Valley Pipeline Co.	—	95	—	95	115,485	—	115,485	64,463	—	64,463	99,568	2,372	41,686	12,553
Milne Point Pipe Line Co.	11	—	—	11	50	—	50	§	—	§	26,885	27	95	-1,000
Minnesota Pipe Line Co.	—	510	—	510	71,823	—	71,823	18,315	—	18,315	68,162	714	24,394	10,175
Mitco Pipeline Co.	9	—	—	9	120	—	120	§	—	§	2,105	—	65	-143
Mobil Alaska Pipeline Co.	—	† 818	—	† 818	29,181	—	29,181	23,233	—	23,233	398,299	557	114,248	45,606
Mobil Eugene Island Pipeline Co.	—	72	—	72	14,247	—	14,247	1,303	—	1,303	44,176	9,809	11,547	4,816
Mobil Pipe Line Co.	3,549	4,597	1,803	9,949	203,465	106,348	309,813	74,262	11,862	86,124	303,623	636	165,643	71,931
National Transit Co.	197	—	—	197	432	—	432	§	—	§	3,677	—	1,123	- 61
Navajo Pipeline Co.	—	70	323	393	—	5,508	5,508	—	1,162	1,162	8,530	- 7	5,753	2,418
Northern Rockies Pipe Line Co.	—	77	—	77	403	—	403	31,088	—	31,088	1,049	—	163	1,513
NW Pipeline Inc.	—	—	—	—	2,681	—	2,681	261	—	261	6,386	6	2,735	1,149
Ohio Oil Gathering Corp.	723	—	—	723	4,579	—	4,579	—	—	—	11,482	741	-7,753	- 30
Ohio River Pipe Line Co.	—	—	400	400	—	16,191	16,191	—	1,937	1,937	23,637	991	7,152	2,168
Oiltanking of Texas Pipeline Corp.	—	19	—	19	47,141	—	47,141	499	—	499	11,307	28	5,365	3,656
Olympic Pipe Line Co.	—	—	391	391	—	90,506	90,506	—	16,573	16,573	60,497	2,430	27,686	6,664
Osage Pipe Line Co.	—	136	—	136	24,453	—	24,453	3,326	—	3,326	19,524	615	4,711	1,079
Owensboro-Ashland Co.	—	296	—	296	71,691	—	71,691	18,997	—	18,997	46,599	1,781	11,983	2,629
Oxy Pipeline Inc.	—	—	—	—	417	—	417	20	—	20	4,833	—	605	282
Palomo Pipeline Co.	—	—	—	—	23,294	—	23,294	1,495	—	1,495	5,763	21	3,178	1,087
Pennzoil Offshore Pipeline Co.	—	4	—	4	644	—	644	31	—	31	3,465	—	1,356	599
Phillips Alaska Pipeline Corp.	—	† 818	—	† 818	10,894	—	10,894	8,262	—	8,262	126,847	280	37,680	15,856
Phillips Pipe Line Co.	1,136	855	4,192	6,183	73,862	217,381	291,243	13,465	47,919	61,384	348,399	17,160	148,403	45,073
Pioneer Pipe Line Co.	—	—	299	299	—	11,913	11,913	—	2,803	2,803	13,565	618	6,479	1,428
PL Pipeline Co.	—	—	—	—	68	—	68	8	—	8	—	87	129	69
Plantation Pipe Line Co.	—	—	3,186	3,186	—	192,460	192,460	—	121,422	121,422	303,100	6,454	120,030	30,767
Platte Pipe Line Co.	—	1,283	—	1,283	46,073	—	46,073	32,817	—	32,817	79,542	370	30,323	10,219
Pogo Offshore Pipeline Co.	—	—	—	—	3,109	—	3,109	324	—	324	9,270	-117	1,997	862
Point Arguello Pipeline Co. (new)														
Point Pedernales Pipeline Co. (1987)	—	46	—	46	4,687	—	4,687	108	—	108	51,840	51,840	11,843	4,097
Portal Pipe Line Co.	297	615	—	912	21,539	—	21,539	8,397	—	8,397	44,343	704	14,160	6,228
Portland Pipe Line Corp.	—	177	—	177	28,913	—	28,913	4,814	—	4,814	41,997	113	15,050	4,051
Santa Fe Pipeline Co.	—	—	928	928	—	40,026	40,026	—	19,139	19,139	57,418	1,429	22,761	7,191
Seminole Pipeline Co.	120	—	634	754	—	48,832	48,832	—	21,679	21,679	206,775	1,002	29,741	-437
Shamrock Pipe Line Corp.	649	318	580	1,547	40,488	22,059	62,547	2,978	2,715	5,693	34,933	745	14,097	812
Shell Pipe Line Corp.	2,060	4,746	429	7,235	412,816	123,206	536,022	107,422	4,843	112,265	466,409	5,387	159,153	60,502
Sohio Alaska Pipe Line Co.	—	† 818	—	† 818	240,586	—	240,586	193,139	—	193,139	2,286,958	5,096	921,898	355,699
Sohio Pipeline Co.	1,093	630	175	1,898	177,576	97,654	275,230	47,676	11,066	58,742	108,461	2,782	82,749	21,280
Sonat Oil Transmission Inc.	—	42	—	42	1,034	—	1,034	10	—	10	5,554	—	785	205
Southcap Pipe Line Co.	—	—	—	—	41,325	—	41,325	24,258	—	24,258	51,911	-1,675	10,549	2,687
Southern Pacific Pipelines Inc.	—	—	2,834	2,834	—	309,166	309,166	—	38,787	38,787	299,150	37,312	103,254	29,054
Sun Oil Line Co. of Michigan	—	—	—	—	5,191	—	5,191	1,043	—	1,043	669	—	2,083	562
Sun Pipe Line Co.	382	441	1,758	2,581	76,607	117,410	194,017	2,553	15,839	18,393	144,995	12,658	64,202	10,446
Tecumseh Pipe Line Co.	—	205	—	205	12,027	—	12,027	1,065	—	1,065	15,207	—	3,526	1,158
Texaco Pipeline Inc.	1,926	3,326	851	6,103	333,931	119,904	453,835	57,668	7,389	65,057	427,716	-6,428	123,752	36,851
Texas Eastern Products Pipeline Co.	—	—	3,373	3,373	—	152,029	152,029	—	80,824	80,824	441,206	23,952	123,247	—
Texas-New Mexico Pipe Line Co.	1,756	2,165	—	3,921	114,489	—	114,489	13,141	—	13,141	90,012	2,238	30,374	9,869
Total Pipeline Corp.	193	583	97	873	70,683	17,200	87,883	8,873	1,351	10,224	53,144	6,250	13,117	-332
Trans Mountain Oil Pipeline Corp.	—	64	—	64	4,153	—	4,153	218	—	218	6,723	- 91	1,376	515

LIQUID PIPELINES (continued)

Company	Miles of pipeline				Deliveries, 1,000 bbl			Total trunkline traffic, Million bbl-miles*			Fiscal data, $1,000			
	Gathering	Trunk Crude	Trunk Products	Total	Crude	Products	Total	Crude	Products	Total	Carrier property	Change	Operating revenue	Income
Trans-Ohio Pipeline Co.	–	–	133	133	–	10,429	10,429	–	403	403	13,843	–	2,975	1,241
Transco Terminal Co.	–	–	–	–	233	–	233	–	–	–	3,271	3	361	83
Unocal Pipeline Co.	766	† 1,554	16	† 2,336	91,713	23,348	115,061	20,226	282	20,508	218,518	794	66,881	26,100
West Emerald Pipe Line Corp.	–	–	296	296	–	2,259	2,259	–	507	507	1,926	78	1,080	91
West Shore Pipe Line Co.	–	–	321	321	–	70,895	70,895	–	8,295	8,295	34,919	375	18,326	5,169
West Texas Gulf Pipe Line Co.	–	579	–	579	113,154	–	113,154	47,049	–	47,049	46,521	371	28,264	11,878
White Shoal Pipeline Corp.	7	–	–	7	3,615	–	3,615	160	–	160	2,619	4	366	14
Williams Pipe Line Co.	–	–	6,752	6,752	3,686	173,544	177,230	2,349	48,215	50,564	536,406	20,681	135,995	14,426
Wolverine Pipe Line Co.	–	–	621	621	–	83,503	83,503	–	10,741	10,741	72,542	393	25,816	7,007
Wyco Pipe Line Co.	–	–	677	677	–	20,442	20,442	–	3,688	3,688	27,147	336	15,485	5,237
Yellowstone Pipe Line Co.	–	–	749	749	–	22,416	22,416	–	7,660	7,660	29,258	436	14,269	4,385
1987 Totals	**35,055**	**54,886**	**77,924**	**167,865**	**6,277,670**	**4,916,665**	**11,194,335**	**1,931,768**	**1,568,133**	**3,499,901**	**21,272,953**	**417,826**	**7,057,235**	**2,475,046**
1986 Totals	**34,209**	**54,153**	**81,852**	**170,014**	**6,296,433**	**4,715,889**	**11,082,322**	**1,893,021**	**1,573,432**	**3,466,473**	**22,383,790**	**644,700**	**7,287,062**	**2,051,372**

Source: U.S. FERC Form 6's: Annual Report of Oil Pipeline Companies, Dec. 31, 1987. *Some barrel-mile data are provided by the American Petroleum Institute, Policy Analysis Dept., Washington, D.C.
†Mileage represents Trans-Alaska pipeline and is included in total only once to avoid duplication. §Fewer than 1 million bbl-miles. ¶Includes 1,097 miles of ammonia pipeline.

GAS PIPELINES

Company	Miles of pipeline				Total compressor stations			Volumes, MMcf		Fiscal data, $1,000			
	Transmission	Field	Storage	Total	Transmission	Other	Total	Sold	Trans. for Others	Gas Plant	Additions	Operating revenues	Net income
Alabama-Tennessee Natural Gas Co.	316	—	—	316	2	—	2	28,031	—	21,445	533	73,665	3,381
Algonquin Gas Transmission Co.*	975	—	—	975	5	—	5	160,226	54,595	341.444	36,459	521,570	18,661
Algonquin LNG Inc.	—	—	—	—	—	—	—	—	—	21,903	102	4,433	445
American Distribution Co.	38	—	—	38	—	—	—	—	1,296	5,210	792	6,710	1,323
ANR Pipeline Co.*	8,845	2,641	195	11,681	45	59	104	166,190	829,644	2,504,365	40,662	1,264,742	200,301
ANR Storage Co.	—	—	24	24	—	3	3	—	—	121,305	112	34,668	12,635
Arkansas Oklahoma Gas Corp.	371	184	—	555	6	—	6	11,717	—	57,473	4,388	4,1538	2,661
Arkla Inc.*	6,023	3,670	3,737	13,430	23	33	56	117,309	297,669	1,406,172	95,543	632,731	78,283
Associated Natural Gas Co.	585	—	—	585	—	—	—	8,253	1,363	42,946	1,874	39,776	856
Bayou Interstate Pipeline System	2	—	—	2	—	—	—	751	—	42	1	1,169	185
Bear Creek Storage Co.	—	—	25	25	—	1	1	—	—	144,420	-427	48,256	-16,958
Black Marlin Pipeline Co.	67	—	—	67	—	—	—	42,955	—	21,833	797	3,256	1,050
Blue Dolphin Pipeline Co.	49	—	—	49	—	—	—	—	12,991	7,670	174	943	-26
Bluefield Gas Co.	32	—	—	32	—	—	—	640	—	2,220	62	3,659	289
Boundary Gas Inc. (new)	—	—	—	—	—	—	—	14,560	—	—	—	34,957	—
Canyon Creek Compression Co.	—	—	—	—	1	—	1	—	43,960	22,224	45	7,961	1,122
Caprock Pipeline Co.	39	14	—	53	2	2	4	90	—	3,794	24	1,120	129
Carnegie Natural Gas Co.	216	874	—	1,090	8	6	14	16,108	602	71,399	1,080	61,337	7,303
Chandeleur Pipe Line Co.	174	—	—	174	—	—	—	—	32,268	20,740	4,540	902	-36
Cimarron Transmission Co.	—	41	—	41	—	—	—	1,863	222	1,479	19	3,187	26
CNG*	3,553	4,154	518	8,225	44	22	66	186,402	259,696	1170325	39,144	982,196	60,022
Colorado Interstate Gas Co.*	2,979	3,055	57	6,091	24	34	58	117,384	225,434	714,451	12,201	470,107	69,284
Columbia Gas Transmission Corp.*	10,934	6,646	1,240	18,820	111	71	182	409,561	579,514	1,954,727	80,602	1,599,263	31,286
Columbia Gulf Transmission Co.*	4,256	—	—	4,256	13	25	38	—	836,574	1,062,503	14,745	147,806	18,503
Columbia LNG Corp.	—	—	—	—	—	—	—	—	7,133	202,080	—	11,920	556
Commercial Pipeline Co. Inc.	75	—	—	75	—	—	—	202	—	905	2	882	68
Consolidated System LNG Co.	112	—	—	112	—	—	—	—	—	68,077	—	15,681	3,630
Distrigas of Mass. Corp.	—	—	—	—	—	—	—	—	—	49,110	291	9,797	-45,747
East Tennessee Natural Gas Co.*	1,084	—	—	1,084	15	1	16	71,743	13	135,935	46,703	201,281	7,557
Eastern Shore Nat. Gas Co.	—	—	—	—	—	—	—	8,444	3,360	14,340	283	27,464	1,896

GAS PIPELINES (continued)

Company	Miles of pipeline				Total compressor stations			Volumes, MMcf		Fiscal data, $1,000			
	Transmission	Field	Storage	Total	Transmission	Other	Total	Sold	Trans. for Others	Gas Plant	Additions	Operating revenues	Net income
El Paso Natural Gas Co.*	10,906	10,899	18	21,823	89	24	113	288,865	862,679	2,579,454	67,755	1,338,709	200,338
Enserch Corp.	8,142	2,297	—	10,439	†49	—	49	227,585	229,021	1,192,420	71,710	1,041,156	30,488
Equitable Gas Co.	536	1,486	—	2,022	18	—	18	51,418	16,925	576,579	29,813	289,253	40,285
Florida Gas Transmission Co.*	2,557	—	—	2,557	20	—	20	239,216	934	530,652	47,946	693,587	39,951
Freeport Interstate Pipeline Co.	9	—	—	9	—	—	—	—	—	—	—	61	2
Gas Gathering Corp.	27	5	—	32	—	—	—	—	3,631	1,584	46	409	57
Gas Transport Inc.	41	68	—	109	—	—	—	2,394	—	3,825	16	8,449	250
Gasdel Pipeline System Inc.	—	—	—	—	—	—	—	—	1,265	14,873	574	4,142	959
Glacier Gas Co.	34	3	—	37	1	—	1	480	—	2,335	2	407	37
Granite State Gas Trans. Inc.	105	—	—	105	1	—	1	39,103	—	9,336	3,563	116,952	672
Great Lakes Gas Transmission Co.*	1,321	—	—	1,321	14	—	14	33,608	404,254	538,206	5,152	261,139	42,769
Great Plains Natural Gas Co.	65	—	—	65	—	—	—	4,291	—	15,267	674	15,012	325
Hampshire Gas Co.	—	18	—	18	—	—	—	—	—	8,774	—	2,338	668
High Island Offshore System*	203	—	—	203	1	—	1	—	492,020	365,931	573	61,644	9,284
Honeoye Storage Corp.	11	19	—	30	—	—	—	44	—	8,762	18	2,099	324
Indiana Utilities Inc.	21	—	—	21	—	—	—	345	—	1,944	187	1,649	125
Inland Gas Co. Inc.	128	394	—	522	—	5	5	4,835	6	23,268	337	15,779	-965
Inter-City Minnesota Pipelines Ltd.	66	—	—	66	—	—	—	—	6,676	3,479	148	15,927	206
Interstate Power Co.	—	—	—	—	—	—	—	17,542	3,783	38,698	2,358	56,243	11,188
Iowa Public Service Co.	—	—	—	—	—	—	—	—	—	—	—	—	—
Iowa-Illinois Gas and Electric Co.	—	—	—	—	—	—	—	43,643	15,263	183,52	5,309	47,846	60,590
Jupiter Energy Corp.	21	—	—	21	—	—	—	—	11,000	2,434	—	352	149
K N Energy Inc.*	9,305	2,921	24	12,250	31	80	111	69,581	15,817	427,182	14,262	290,318	13,332
Kentucky-West Va. Gas Co.	105	2,082	—	2,187	5	6	11	14,825	12,486	69,980	5,767	43,775	2,049
Lawrenceburg Gas Transmission Corp.	6	—	—	6	—	—	—	794	—	476	21	3,678	-24
Louisiana-Nevada Transit Co.	78	—	—	78	—	—	—	2,948	16	2,527	134	4,569	498
Michigan Consolidated Gas Co.*	2,295	84	112	2,491	17	8	25	191,020	115,379	1,472,734	59,312	1,198,111	48,797
MIGC Inc.*	171	10	—	181	3	2	5	2,617	12,359	13,207	1,382	10,372	-1,328
Midwestern Gas Transmission Co.*	903	—	10	913	14	1	15	127,475	7.529	176,536	4,793	404,463	9,341
Miss. River Transmission Corp.*	1,997	169	75	2,241	15	6	21	145,609	47	419,187	17,755	410,333	27,423
Mountain Fuel Resources Inc. (now Questar Pipeline Co.)	1,532	786	50	2,368	14	33	47	—	—	369,609	25,350	245,618	19,959
National Fuel Gas Distribution Corp.	654	336	—	990	—	2	2	131,271	16,794	648,225	36,422	502,195	14,895
National Fuel Gas Supply Corp.*	1,397	1,506	481	3,384	16	28	44	—	24,350	278,170	-7,653	384,682	20,061
Natural Gas Pipeline Co. of America*	10,786	1,761	105	12,652	70	79	149	194,913	1,058,978	2,428,103	52,451	1,228,224	129,468
North Penn Gas Co.	570	271	—	841	—	1	1	10,416	2,045	44,387	2,140	43,616	2,077
Northern Border Pipeline Co.*	824	—	—	824	2	—	2	—	223,655	12,948,456	482	230,599	60,861
Northern Natural, Div. of Enron*	15,420	7,912	208	23,450	117	5	122	414,179	699,965	2,218,056	20,519	1,376,227	5,647
Northwest Alaskan Pipeline Co.*	—	—	—	—	—	—	—	170,467	—	—	—	371,912	-1,266
Northwest Pipeline Corp.*	3,535	3,481	7	7,023	29	28	57	201,262	293,535	1,394,353	17,114	740,625	55,770
Ohio River Pipeline Corp.	24	—	—	24	—	—	—	4,001	2,914	3,670	6	14,949	160
Orange & Rockland Utilities Inc.	—	—	—	—	—	—	—	19,856	—	124,128	7,259	413,943	40,904
Overthrust Pipeline Co.*	89	—	—	89	—	—	—	—	53,623	63,042	41	9,250	1,547
Ozark Gas Transmission System	—	—	—	—	—	—	—	—	23,710	146,051	405	21,687	-601
Pacific Gas Transmission Co.*	799	42	—	841	12	1	13	358,401	118,941	409,846	5,440	761,838	7,993
Pacific Interstate Trans. Co.	351	—	—	351	2	—	2	101,741	—	63,212	533	312,364	1,857
Pacific Offshore Pipeline Co.	—	—	—	—	—	—	—	9,206	—	12,014	—	66,026	6,494
Panhandle Eastern Pipeline Co.*	6,663	5,863	100	12,626	68	67	135	123,947	304,872	1,558,917	87,503	855,730	128,095
Penn Jersey Pipeline Corp.	—	—	—	—	—	—	—	—	546	235	—	41	9
Penn York Energy Corp.	—	—	33	33	—	2	2	—	—	59,171	5,759	23,467	4,303
Pennsylvania & Southern Gas. Co.	—	—	—	—	—	—	—	5,550	408	17,877	706	24,394	1,021
Phillips Gas Pipeline Co.	153	—	—	153	—	—	—	5,830	5,700	49,061	353	17,576	-926
Point Arguello Natural Gas Line (new)*													
Raton Gas Transmission Co.	21	—	—	21	—	—	—	1,212	—	533	259	4,183	63

GAS PIPELINES (continued)

Company	Miles of pipeline				Total compressor stations			Volumes, MMcf		Fiscal data, $1,000			
	Transmission	Field	Storage	Total	Transmission	Other	Total	Sold	Trans. for others	Gas plant	Additions	Operating revenues	Net income
Ringwood Gathering Co.	43	273	—	316	—	2	2	2,398	5,339	10,321	107	7,549	212
Sabine Pipe Line Co.	188	—	—	188	—	—	—	—	7,670	37,367	15	6,322	1,548
Seagull Interstate Corp. (new)	7	5	—	12	—	—	—	—	14,378	6,234	—	790	-8
Sea Robin Pipeline Co.*	420	—	—	420	2	2	4	29,316	121,927	251,230	263	132,708	3,731
Shenandoah Gas Co.	82	—	—	82	—	—	—	4,231	—	15,710	948	17,245	849
South County Gas Co.	—	—	—	—	—	—	—	436	137	3,232	159	2,953	298
South Georgia Natural Gas Co.	767	–	–	767	2	–	2	11,426	11,666	23,302	282	55,589	468
South Penn Gas Co.	24	—	—	24	—	—	—	268	—	641	44	1,416	52
Southern Energy Co. (LNG)	—	—	—	—	—	—	—	—	—	155,220	12	10,707	4,280
Southern Natural Gas Co.*	7,653	124	48	7,825	47	13	60	172,330	122,117	1,275,681	31,790	869,714	89,676
Southwest Gas Corp.	1,249	8	—	1,257	†5	—	†5	18,317	—	790,290	97,692	468,584	39,700
Southwest Gas Storage Co.	—	—	31	31	—	1	1	—	—	68,967	-2	20,903	5,436
Southwest Gas Transmission Co.	—	8	—	8	—	—	—	18,371	—	1,539	—	356	75
Stingray Pipeline Co.*	353	—	—	353	2	—	2	—	242,352	248,347	3,212	36,977	6,602
Superior Offshore Pipeline Co.	112	—	—	112	—	—	—	—	66,298	12,882	—	720	-363
Tarpon Transmission Co.	40	—	—	40	—	—	—	—	—	21,089	—	3,317	2,411
TCP Gathering Co.	—	20	—	20	—	—	—	—	1,405	1,141	281	158	44
Tennessee Gas Pipeline Co.*	14,073	31	2	14,016	68	1	69	421,218	931,909	3,607,957	101,489	1,629,284	-215,721
Texas Eastern Transmission Corp.*	9,726	48	196	9,970	78	8	86	651,606	387,563	2,911,384	161,897	1,917,907	136,483
Texas Gas Pipe Line Corp.	6	—	—	6	—	—	—	1,764	—	325	—	3,173	-25
Texas Gas Transmission Corp.*	5,516	46	212	5,774	29	9	38	189,648	589,089	926,399	22,048	788,985	68,559
Texas Sea Rim Pipeline Inc.	29	—	—	29	—	—	—	—	19,253	15,542	64	1,117	-126
Trailblazer Pipeline Co.*	436	—	—	436	—	—	—	—	54,795	269,218	247	38,331	2,809
Transco Gas Supply Co.*	—	—	—	—	—	—	—	22,717	—	10	—	65,045	2,047
Transcontinental Gas Pipe Line Corp.*	10,315	150	121	10,586	40	32	72	396,815	1,093,805	3,189,665	56,886	1,712,297	-20,650
Transwestern Pipeline Co.*	3,835	628	—	4,463	22	97	119	116,464	98,366	689,192	7,202	414,755	41,181
Trunkline Gas Co.*	4,020	498	524	5,042	21	16	37	160,374	292,223	991,331	9,036	744,448	54,769
Trunkline LNG Co.	—	—	—	—	—	—	—	—	—	578,982	162	54,713	343
U-T Offshore System*	30	—	—	30	—	—	—	—	307,063	63,030	4	8,554	635
Union Gas System Inc.	—	16	9	25	1	4	5	9,323	2,0498	34,283	3,985	37,499	817
Union Light, Heat & Power Co.	—	—	—	—	—	—	—	10,058	8140	72931	7,148	53,785	8,979
United Gas Pipe Line Co.*	7,352	2,407	28	9,787	31	13	44	98,492	662,868	1,135,205	31,700	833,894	-352,834
Valero Interstate Trans. Co.	--	—	—	—	—	—	—	233	30,974	13,709	305	4,579	393
Valley Gas Transmission Inc.		274	—	274	—	—	—	2,600	3,836	5,047	51	5,918	254
Washington Gas Light Co.	366	—	—	366	—	—	—	116,098	172	841,374	61,857	653,374	39,452
West Texas Gas Inc.	—	—	—	—	—	—	—	691	—	19,322	395	21,618	3,107
West Texas Gathering Co.	—	—	—	—	—	—	—	2,121	3,247	11,181	4	4,389	-631
Western Gas Interstate Co.	191	50	—	241	†9	†9	—	2,590	—	8,214	244	5,908	-34
Western Transmission Corp.	—	61	—	61	—	—	—	—	1,546	580,267	—	148	112
Williams Natural Gas Co.*	5,844	3,763	176	9,783	42	55	97	188,313	91,908	642,614	14,526	573,629	13,014
Williston Basin Interstate Pipeline Co.*	3,075	847	160	4,082	24	7	31	29,288	47,156	204,389	6,867	121,924	3,562
Wyoming Interstate Co. Ltd.*	269	—	—	269	1	—	1	[illegible]	65,444	176,770	70	22,654	1,784
Zenith Natural Gas Co.	27	32	—	59	—	[illegible]	[illegible]	[illegible]	—	677	44	1,240	47
1987 Totals—majors (44)	180,737	63,356	8,354	252,447	1,205	[illegible]	[illegible]	[illegible]	12,880,681	41,995,776	1,208,123	26,358,565	1,117,717
1986 Totals—majors ([illegible])	184,434	64,148	5,058	253,651	1,459	842	[illegible]	[illegible]	—	42,237,306	1,331,595	33,050,455	1,350,236
1987 Totals—all	198,578	72,981	8,526	280,085	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	49,911,087	1,597,323	32,010,750	1,328,773
1986 Totals—all	201,682	72,934	5,274	279,870	[illegible]	911	[illegible]	[illegible]	—	49,375,861	1,659,397	40,864,631	1,853,010

Source: FERC Forms 2's & 2A's for major and nonmajor natural-gas pipeline companies. Under criteria established for the 1984 reporting year (OGJ, Nov. 25, 198[illegible] [illegible] companies are those whose combined gas sold for resale and gas transported or stored for a fee exceeded 50 bcf at 14.73 psi (60° F.) in each of the 3 previous calendar years. Nonmajors are [illegible] not classified as majors and having had total gas sales of volume transactions exceeding 200 MMcf at 14.73 psi (60° F.) in each of the 3 previous calendar years. * Major natural-gas pipelines [illegible] under FERC accounting and Reporting Requirements for Natural Gas Companies, para. 20-011, effective Feb. 2, 1985, beginning with 1984 reporting year. † Type of compressor station not in[illegible] by reporting company.

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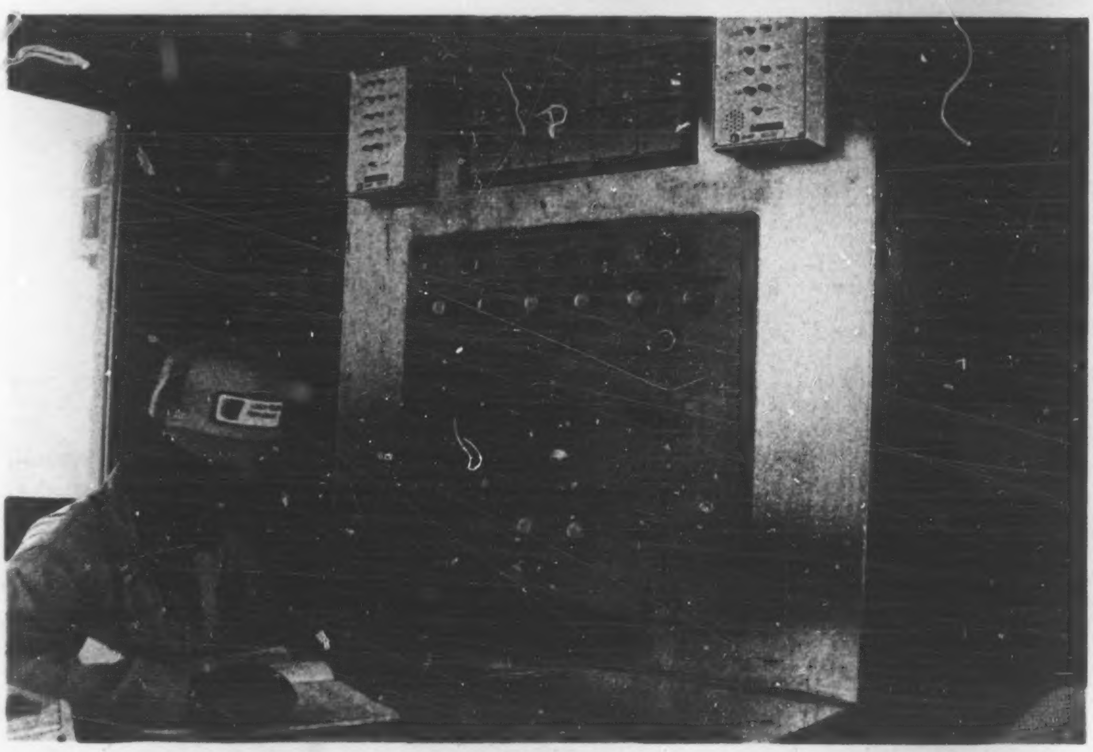


Gauger logs output of Pakistan's Mazari oil field, operated by Union Texas Pakistan Inc. with partners Occidental Petroleum Corp. and state owned Oil & Gas Development Corp. Pakistan is one of several countries outside the Organization of Petroleum Exporting Countries adding rapidly to oil and gas reserves.

Reserves up worldwide and outside OPEC

Worldwide Report

More competition is taking shape for the Organization of Petroleum Exporting Countries.

Even as the group pushed oil markets to the brink of collapse with another production surge, new sources of internationally traded oil appeared on the horizon in 1988.

According to Oil & Gas Journal estimates, worldwide reserves of crude oil and lease condensate increased 2.3% this year to 907.44 billion bbl after leaping 27% last year (OGJ, Dec. 28, 1987, p. 33). Natural gas reserves increased by 4.2% to 3.955 quadrillion cu ft.

That there could be any increase at all is significant in the wake of last year's huge jump and in a period when shaky crude prices are restraining exploration. What's more important, the world outside OPEC had a greater proportionate reserves increase than the exporter's group, and much of the gain came in developing countries with low internal demand.

To be sure, OPEC still dominates reserves totals.

Its 676.009 billion bbl reserves total accounts for 75% of the global sum and 82% of the non-Communist figure. In all, OPEC members added 0.8% to reserves this year, largely via additions of 3 billion bbl by Saudia Arabia and 1.7 billion bbl by Venezuela.

But non-OPEC reserves gained 6.8% to 231.434 billion bbl. Much of the increase came in countries such as South Yemen and Angola, which have relatively slight internal demand, great revenue needs, and little incentive to restrict exports.

These countries don't have OPEC quotas. South Yemen hasn't started exporting yet. Moreover, potential incremental volumes look modest.

But 1988 reminded the world of how important extra volumes in international trade can be.

Rising non-OPEC productive capacity turns up pressure on an unsettled OPEC to secure some form of production limits from outside the organization. And that, in turn, makes it all the more critical for the group to make its own agreements work—something nonmember producers demand before making cuts of their own.

Pact unravels. OPEC spent 1988 unraveling a late 1986 production accord that gave oil markets something of a breather in 1987—a year of stable worldwide production, refortified prices, and false hopes for the oil producing industry.

The group's output averaged 19.27 million b/d this year, about 1.5 million b/d more than the 1987 level and nearly 3 million b/d more than the notional quota set in 1986.

The OPEC boost accounted for most of a worldwide production gain to 57.7 million b/d in 1988 from 56.01 million b/d in 1987.

It also dashed industry's expectations of firm, if not rising, crude oil prices.

At times during the first half, West Texas intermediate crude futures contracts traded in the U.S. at more than $18/bbl. By summer, OPEC production exceeded 20 million b/d, pushing the futures price to $13-14/bbl. Arab light spot cargoes changed hands at as little as $9.05/bbl.

Quota busters did little to hide their actions. The U.A.E.—mainly Abu Dhabi—unilaterally boosted its OPEC quota to 1.5 million b/d from 948,000 b/d under the 1986 agreement—then pushed production well beyond the self-assigned limit. Other significant violators: Saudi Arabia and Kuwait.

Motivations were unclear. Group politics certainly changed during the year as Iran and Iraq wound down their 8 year war. According to one theory, the Persian Gulf overproducers wanted to restrain Iraq, which never acknowledged its 1.54 million b/d OPEC quota. It had stepped up output to 2.7 million b/d by the time the group held its make or break Vienna ministerial meeting in November.

At that meeting, the Iran-Iraq clash played a key role in OPEC's accepting an agreement that may prove considerably less than perfect. Iraq, having more than doubled its reserves a year earlier and opening new outlets for exports, demanded an OPEC quota reflecting its demonstrated ability to match Iranian flow.

Iran at first balked at Iraqi production parity. And it demanded a 14.27% share of total OPEC production.

OPEC found a way to balance the interests, with Iran yielding on Iraqi production parity. The group raised its total production limit to 18.5 million b/d, pushed the Iranian quota to the 2.64 million b/d level enabling it to meet its share goal, granted Iraq an identical quota, and trimmed other members' quotas as necessary.

The key to compromise may be the fatal flaw: a group quota at least 1 million b/d more than the demand for OPEC oil expected in first quarter 1989. The excess certainly will make it difficult for the group to attain its $18/bbl target price with global inventories brimming from this year's overproduction.

Stubbornly low prices would again test members' discipline as demand takes its seasonal drop early in 1989. A critical element will be production restraint outside OPEC, mainly by Norway, Mexico, and the Soviet Union.

All three have limited production voluntarily or hinted that they would do so to support prices. Whether they and others will this time, and whether they cut enough to make a difference, will depend greatly on the OPEC quota discipline they see in 1989 and come to expect for the future.

Reserves critical. That's why this year's non-OPEC reserves additions are important: A reserves increase means greater potential production in a market crying out for production restraint.

North and South Yemen promise to become significant exporters soon.

North Yemen shipped its first cargo of crude from Alif field early this year and is rapidly developing infrastructure. Exploration continues, and OGJ estimates reserves increased to 1 billion bbl. Production averaged 160,000 b/d.

South Yemen made its first public estimate of reserves this year: 3.38 billion bbl. The oil ministry didn't specify how much of that volume is proved. But it compares with no reserves in earlier years.

The country's production will come from the Shabwa area, under development by the Soviet Union's Technoexport. It's across the border from North Yemen's Marib-Jawf concession, where Yemen Hunt Oil Co. and partners operate Alif field.

North Yemen wants production to reach 400,000 b/d in the early 1990s. South Yemen's production targets are unclear. It is building a pipeline from Shabwa to the coast with an initial capacity of 100,000 b/d, expandable to 500,000 b/d. Output averaged 12,500 b/d this year.

Angola's reserves nearly doubled to 2.02 billion bbl this year. Several international operators have reported significant discoveries off the country and its Cabinda enclave.

The country exports most of its production—at 449,000 b/d, up 25% for the second year in a row.

Mexico reported nearly 7 billion bbl of condensate reserves this year, which may account for an oil reserves increase of about the same size from its figure for last year, when it reported only crude and didn't specify whether the figure included condensates.

Mexico produced an average 2.53 million b/d in 1988 and maintained a voluntary export ceiling of 1.35 million b/d.

Other changes. Another non-OPEC exporter keeping production below capacity reported a significant reserves decline this year. Norway dropped its oil reserves to 10.4 billion bbl from 14.8 billion bbl and gas reserves to 85.5 tcf from 105.94 tcf.

It cited production—at 1.07 million b/d, up 7.9%—and lower estimates for Haltenbanken reserves.

Colombia, a recently renewed exporter with exploration active in the Magdalena Valley and Cano Limon areas, hiked its reserves estimate to 2.03 billion bbl from 1.6 billion bbl. But production declined 10% to 346,700 b/d, in part due to guerrilla attacks on pipelines from supergiant Cano Limon field.

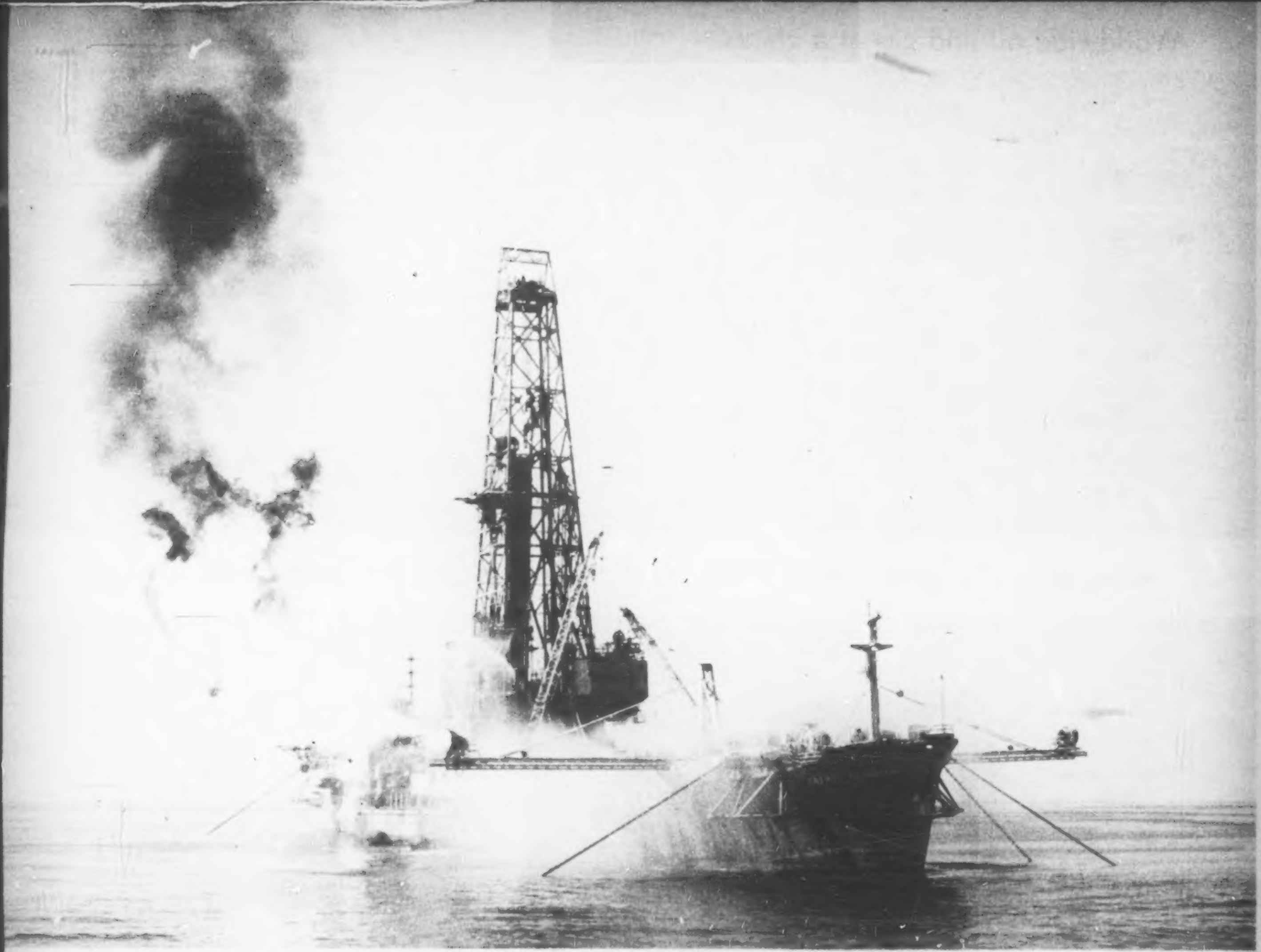
Venezuela's 1.7 billion bbl addition early in 1988 pushed reserves to 58 billion bbl. Most of the increase came from giant discoveries of light and medium crude in the Eastern Venezuelan basin.

Some nonexporters are adding rapidly to their reserves, which means future production and reduced demand for internationally traded crude.

India lifted reserves to 6.354 billion bbl from 4.25 billion bbl. Historically, the country's production has centered around offshore Bombay High field in the west. But exploratory efforts elsewhere have begun paying off, most recently in the Cauvery basin on and off the eastern coast.

Production climbed 3.7% to 631,800 b/d this year.

Brazil hiked reserves, too, although not as much—to 2.55 billion bbl from 2.34 billion bbl. The offshore Campos



Drillship Energy Searcher tests BHP Petroleum Pty. Ltd. 1 Montara, a discovery in the Timor Sea off Australia. The well flowed at a maximum rate of 5,736 b/d of oil through a 2 in. choke. Photo courtesy of BHP Petroleum.

basin off Rio de Janeiro continues to yield major discoveries. State owned Petroleo Brasileiro SA (Petrobras) recently has reported significant discoveries in the Upper Amazon region and elsewhere offshore.

Brazilian production slipped 1.8% this year to 555,600 b/d, mainly due to a Campos basin platform blowout and fire, followed by a 9 day Petrobras strike.

Another fast gainer is Pakistan, where reserves jumped to 170.4 million bbl from 96 million bbl and production gained 12% to 47,000 b/d.

Denmark's reserves jumped to 861 million bbl from 440 million bbl thanks to recent discoveries in its sector of the North Sea. The country has relaxed terms and opened unallocated acreage for exploration.

Danish production increased 2.2% this year to 95,500 b/d.

OGJ increased its estimate of U.S. oil reserves this year to 26.5 billion bbl from 25.27 billion bbl, guided mainly by an Energy Information Administration revision to its yearend 1987 figure reflecting new estimates of Alaskan reserves. Production dropped 2.2% to 8.17 million b/d.

Refining capacity up. Worldwide refining crude capacity rose to an estimated 73.2 million b/cd, effective Jan. 1, 1989, from 72.9 million b/cd at the beginning of this year.

The increase masks an overall streamlining of the refining industry, as well as a regional shift under way for several years. Crude capacity fell in Asia-Pacific and Western Europe. It increased in the Middle East, Africa, Communist areas, and the Western Hemipshere.

A combination of crude prices below year-earlier levels and recently modernized plants widened refiners' profit margins this year. The renewed profitability delayed plant closures and other capacity cuts still in company plans.

In general, new plants in the Middle East have put pressure on older, less efficient refineries elsewhere, especially in Western Europe and Singapore.

Members of the European Community expect to cut a further 280,000 b/d of distillation capacity by 1995. During 1980-1987, capacity in the 12 member countries fell to 11.84 million b/d from 18.4 million b/d.

Another key trend in Europe refining is upgrade of facilities to boost output of unleaded gasoline.

Total distillation capacity in Singapore, the key refining center east of Suez, fell by 6,000 b/cd to 852,000 b/d this year. The country's five refineries face growing competition from the Middle East and facilities planned elsewhere in Southeast Asia.

Singapore and Western Europe both may have a new competitor next year if the 325,000 b/d Rabigh refinery in Saudi Arabia comes on stream as planned. ▪

Worldwide oil and gas at a glance

COUNTRY	ESTIMATED PROVED RESERVES 1-1-89		OIL PRODUCTION			REFINING Capacity on 1-1-89				
	Oil (1,000 bbl)	Gas (bcf)	Producing wells* 12-31-87	Estimated 1988 (1,000 b/d)	% change from 1987	No. of ref.	Crude b/cd	Thermal operations b/cd	Catalytic cracking b/cd	Catalytic reforming b/cd
ASIA-PACIFIC										
Australia	1,673,089	16,633	926	552.3	+0.4	10	644,100	...	190,300	159,600
Bangladesh	500	12,715	10	0.9	...	1	31,200	...	...	1,650
Brunei	1,400,000	11,600	608	138.3	−0.6	1	10,000	...	...	...
Burma	54,000	9,460	450	15.0	−21.1	2	26,300	1,700	...	...
China, Taiwan	5,000	885	81	2.6	...	2	570,000	13,500	22,500	58,250
India	6,354,200	22,861	2,670	631.8	+3.7	12	1,051,441	110,670	133,953	26,030
Indonesia	8,250,000	83,590	6,065	1,137.5	−4.1	6	714,200	81,700	12,600	61,500
Japan	54,500	1,410	387	12.3	+0.8	41	4,362,750	82,800	596,950	551,650
Korea, South	...	...	...	...	...	6	880,000	49,000	...	62,450
Malaysia	2,922,000	51,700	448	540.0	+8.4	4	209,300	...	....	21,980
New Zealand	182,650	5,150	40	28.0	−3.4	1	88,400	...	...	21,900
Pakistan	170,438	17,722	77	47.0	+11.9	3	130,050	...	...	5,450
Papua New Guinea	200,000	3,030	...	...	...	...	...	...	...	...
Philippines	15,800	9	11	9.2	+64.3	4	254,000	...	23,100	39,400
Singapore	...	...	...	...	...	5	852,000	137,700	....	58,300
Sri Lanka	...	...	...	...	...	1	50,000	12,500	...	3,750
Thailand	85,200	3,885	245	38.4	+20.0	3	191,045	16,920	8,100	26,280
Total Asia-Pacific	**21,367,377**	**240,650**	**12,018**	**3,153.3**	**+0.9**	**102**	**10,064,786**	**506,490**	**987,503**	**1,096,190**
WESTERN EUROPE										
Austria	100,000	420	1,198	23.2	+10.5	1	20[illegible],000	17,000	24,000	32,000
Belgium	...	...	...	...	...	4	630,500	62,800	102,000	80,300
Cyprus	...	...	...	...	...	1	17,100	...	...	4,250
Denmark	881,000	4,320	NA	95.5	+2.2	3	176,500	70,670	...	31,700
Finland	...	...	...	...	...	2	241,000	46,300	41,800	42,900
France	206,030	1,180	625	68.7	+5.7	14	1,875,970	152,850	319,200	247,000
Germany, West	408,000	9,393	3,088	77.9	+4.1	15	1,518,200	269,500	179,400	275,100
Greece	20,000	140	16	21.8	−3.1	4	384,500	41,120	50,500	51,300
Ireland	...	1,800	...	...	...	1	56,000	...	...	11,000
Italy-Sicily	739,000	10,240	174	92.9	+59.3	19	2,450,200	360,400	278,300	284,300
Netherlands	205,590	62,507	478	83.7	−2.3	7	1,380,700	154,360	125,500	166,400
Norway	10,435,000	85,500	215	1,069.1	+7.9	3	239,400	77,300	...	30,100
Portugal	...	...	...	...	...	3	313,300	...	10,100	52,200
Spain	25,955	840	47	30.4	−4.1	10	1,285,000	173,000	164,000	171,600
Sweden	...	...	...	...	...	5	426,500	67,000	25,000	71,000
Switzerland	...	...	...	...	...	2	132,000	20,000	...	26,000
Turkey	381,000	1,037	571	50.0	−2.5	5	724,654	4,500	34,128	63,127
United Kingdom	5,175,000	22,740	787	2,376.3	−3.1	15	1,803,100	152,000	442,000	307,500
Total Western Europe	**18,556,575**	**200,117**	**7,199**	**3,989.5**	**+1.1**	**114**	**13,858,624**	**1,688,800**	**1,795,928**	**1,947,777**
MIDDLE EAST										
Abu Dhabi	92,205,000	183,500	1,001	1,012.6	+4.6	2	180,000	...	...	30,055
Bahrain	126,000	6,700	274	42.3	+0.5	1	243,000	20,000	39,000	18,000
Dubai	4,000,000	5,015	150	355.3	−5.9	...	...	...	...	...
Iran	92,850,000	494,400	361	2,207.5	−4.4	4	530,000	80,800	...	63,845
Iraq	100,000,000	95,000	868	2,679.2	+23.5	8	318,500	...	...	43,500
Israel	1,619	30	10	0.3	...	2	180,000	70,000	20,000	26,000
Jordan	5,000	980	3	0.5	...	1	100,000	....	4,410	8,640
Kuwait	91,920,000	42,500	363	1,254.2	+11.8	4	817,000	54,000	42,000	33,000
Lebanon	...	...	...	...	...	2	37,000	...	7,250	7,492
Neutral Zone	5,210,000	12,300	492	316.3	−18.7	...	...	...	...	...
Oman	4,071,160	9,320	1,004	596.7	+7.1	1	76,932	...	....	15,386
Qatar	3,150,000	156,700	174	349.2	+23.8	1	62,000	...	...	12,030
Ras al Khaimah	400,000	2,000	6	10.0	...	...	...	...	...	...
Saudi Arabia	169,970,000	145,848	588	4,708.3	+16.9	7	1,375,000	32,000	76,000	180,900
Sharjah	1,500,000	11,000	20	65.0	...	...	...	...	...	...
Syria	1,730,000	13,130	963	273.3	+18.8	2	243,744	36,384	...	18,994
Yemen, North	1,000,000	3,700	12	159.9	+788.3	1	10,000	...	...	2,500
Yemen, South	3,380,000	...	...	12.5	+316.7	1	161,500	...	...	10,800
Total Middle East	**571,518,779**	**1,182,123**	**6,289**	**14,043.1**	**+11.7**	**37**	**4,334,676**	**293,184**	**188,660**	**471,142**

EDITOR'S NOTE: All reserves figures except those for the U.S.S.R. (and gas for Canada) are reported as proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves" which include proved, probable, and some possible. Canadian gas figure, under criteria adopted by Canadian Petroleum Association in 1980, includes proved and some probable. *Does not include shut in, injection, or service wells. †Estimates based on capacity as of Jan. 1, 1989, plus known 1988 closures and expansions. ‡Includes Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, Poland, Romania, Viet Nam, and Yugoslavia.

COUNTRY	ESTIMATED PROVED RESERVES 1-1-89 Oil (1,000 bbl)	Gas (bcf)	OIL PRODUCTION Producing wells* 12-31-87	Estimated 1988 (1,000 b/d)	% change from 1987	No. of ref.	REFINING Capacity on 1-1-89 Crude	Thermal operations	Catalytic cracking	Catalytic reforming
							b/cd			
AFRICA										
Algeria	8,400,000	104,200	840	666.8	+2.7	4	464,700	...	...	55,600
Angola-Cabinda	2,024,000	1,900	396	449.3	+24.8	1	32,100	...	...	1,900
Benin	100,000	...	6	4.6	−13.2	...	...	...	...	...
Cameroon	400,000	3,880	175	170.0	−2.3	1	42,000	...	...	7,000
Congo	710,000	2,440	289	134.8	+9.6	1	21,000	...	...	2,000
Egypt	4,300,000	11,470	821	851.3	−5.0	8	489,203	16,470	...	30,940
Ethiopia	...	...	...	...	...	1	18,000	...	...	2,270
Gabon	720,000	600	299	175.0	+12.9	1	24,000	7,200	...	1,400
Ghana	1,000	...	0	...	...	1	26,600	...	...	5,850
Ivory Coast	120,000	3,530	17	12.9	−24.1	2	60,000	...	...	16,600
Kenya	...	...	...	...	...	1	90,000	...	...	9,000
Liberia	...	...	...	...	...	1	15,000	...	...	2,000
Libya	22,000,000	25,700	664	1,012.5	−7.1	3	329,400	...	...	13,982
Madagascar	...	...	...	...	...	1	16,350	7,000	...	2,600
Morocco	2,600	100	5	0.4	...	2	154,600	...	5,600	26,800
Mozambique	...	2,290	...	...	...	...	...	...	...	...
Nigeria	16,000,000	85,000	1,522	1,358.3	+9.4	4	414,500	...	84,000	71,000
Senegal	...	...	...	...	...	1	29,800	...	...	2,870
Sierra Leone	...	...	...	...	...	1	10,000	...	...	...
Somalia	...	210	...	...	...	1	10,000	...	...	...
South Africa	...	1,760	...	...	...	4	433,500	63,500	84,400	62,800
Sudan	300,000	3,000	...	...	...	1	21,440	...	...	1,700
Tanzania	...	4,100	...	...	...	1	13,500	...	...	3,000
Tunisia	1,790,000	3,100	152	102.8	−0.9	1	34,000	...	...	3,300
Zaire	96,170	30	110	29.5	−4.8	1	16,700	...	...	3,500
Zambia	...	...	...	...	...	1	20,594	...	...	5,070
Total Africa	56,963,770	253,310	5,296	4,968.2	+2.5	44	2,786,987	94,170	174,000	331,182
WESTERN HEMISPHERE										
Argentina	2,268,000	26,700	8,389	449.6	+5.5	11	690,400	125,100	124,800	41,000
Barbados	3,300	7	80	1.1	...	1	3,000	...	...	...
Bolivia	176,200	5,354	300	18.8	−0.5	3	57,500	...	...	14,900
Brazil	2,550,000	3,700	5,909	555.6	−1.8	13	1,407,300	33,800	350,500	24,800
Canada	6,785,514	95,100	37,882	1,604.6	+4.7	27	1,855,800	88,250	387,600	369,600
Chile	287,000	4,200	325	24.8	+1.2	3	146,800	20,000	36,670	10,000
Colombia	2,028,000	3,943	2,711	346.7	−9.9	4	227,400	60,000	91,000	6,000
Costa Rica	...	...	...	...	...	1	16,200	6,500	....	1,200
Dominican Republic	...	...	...	...	...	2	47,000	...	...	7,500
Ecuador	1,350,000	4,020	942	310.1	+77.5	3	123,300	25,200	16,000	2,780
El Salvador	...	...	...	...	...	1	17,000	...	...	3,800
Guatemala	80,830	20	15	3.7	...	1	16,000	...	...	3,000
Honduras	...	...	...	...	...	1	14,000	...	...	1,800
Jamaica	...	...	...	...	...	1	34,200	...	...	3,240
Martinique	...	...	...	...	...	1	12,800	...	...	7,410
Mexico	54,110,000	74,831	3,768	2,527.3	−0.5	9	1,354,000	82,000	267,000	157,800
Netherlands Antilles	...	...	...	...	...	1	320,000	67,000	42,000	15,000
Nicaragua	...	...	...	...	...	1	14,500	...	...	2,800
Panama	...	...	...	...	...	1	100,000	...	...	7,500
Paraguay	...	...	...	...	...	1	7,500	...	...	...
Peru	456,806	623	3,529	141.7	−13.4	6	172,438	...	22,540	1,680
Puerto Rico	...	...	...	...	...	2	123,000	....	12,000	5,800
Suriname	28,700	...	74	2.6	+13.0	...	...	...	...	...
Trinidad & Tobago	528,000	10,500	3,255	149.3	−4.9	2	300,000	16,000	28,000	31,000
Uruguay	...	...	...	...	...	1	33,000	....	4,100	2,500
Venezuela	58,083,900	102,243	28,101	1,658.0	+4.5	6	1,201,100	138,000	193,100	6,000
Virgin Islands	...	...	...	...	...	1	545,000	80,000	...	125,000
United States	26,500,000	187,200	613,430	8,165.9	−2.2	†182	†15,556,700	†1,877,400	†5,336,100	†3,839,400
Total Western Hemisphere	155,236,250	518,441	708,710	15,959.8	+0.2	286	24,395,938	2,621,250	6,911,410	4,691,510
Total non-Communist	823,642,751	2,394,641	739,512	42,113.9	+4.2	583	55,441,011	5,203,894	10,057,501	8,537,801
COMMUNIST AREAS										
China	23,550,000	31,700	39,500	2,690.3	+0.3	40	2,200,000	NA	NA	NA
U.S.S.R.	58,500,000	1,500,000	128,000	12,476.8	...	39	12,300,000	NA	NA	NA
Others§	1,750,000	29,000	NA	422.0	−1.9	45	3,298,135	NA	NA	NA
Total Communist	83,800,000	1,560,700	167,500	15,589.1	...	124	17,798,135	NA	NA	NA
TOTAL WORLD	907,442,751	3,955,341	907,012	57,703.0	+3.0	707	[illegible],239,146	5,203,894	10,057,501	8,537,801

Worldwide Production

- Offshore (e) Estimated (c) Condensate (NA) Not available

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
ABU DHABI	DEPARTMENT OF PETROLEUM	Asab, 1965	8,000- 8,700	106	248	242,900	1,476,700,000	40.8
		Bab, 1958	8,600- 9,300	100	232	...	680,100,000	40.6
		Bu Hasa, 1962	8,300- 9,200	201	371	335,500	2,785,700,000	39.0
		Sahil, 1967	9,500- 9,800	22	52	7,700	57,000,000	39.7
		• Umm Shaif, 1958	9,800-12,000	142	203	139,400	1,398,600,000	37.0
		• Zakum Lower, 1963	8,000-9,000	131	254	103,700	1,212,700,000	39.0
		• Zakum Upper, 1963	7,000-8,000	142	262	167,300	364,700,000	35.0
		• Umm Addalkh, 1969	7,700-8,500	32	54	11,200	9,300,000	32.5
		• Satah, 1975	8,550-9,500	10	21	4,600	1,700,000	39.8
		• Arzanah, 1973	11,000-11,300	14	34	11,500,000	38,900,000	44.6
		• Abu Al Bukhoosh, 1969	8,900-10,900	42	48	21,300	300,200,000	32.0
		• Mubarraz, 1969	8,300-10,000	28	28	15,300	99,500,000	37.0
		• Bunduq,* 1964	9,400-10,900	23	40	11,700	22,800,000	40.0
		Total Abu Dhabi		**1,001**	**1,863**	**1,083,400**	**8,458,800,000**	
ALGERIA(e)	SONATRACH	Zarzaitine, 1957	4,700	840	840	649,000	7,537,780,000	42.2
		Edjeleh, 1956	1,500- 2,800					37.2
		Tiguentourine, 1966	2,160- 4,265					44.4
		El Adeb Lareche, 1958	4,100					43.3
		Assakaifaf N. & S., 1958	2,800					42.7
		Tan Emellel N. & S., 1960	2,800- 4,500					42.5
		Edeyen, 1964	5,580					41.5
		Hassi Mazoula S., 1963	4,430					40.2
		Hassi Mazoula B., 1965	4,920					42.0
		Acheb W. & Kreb, 1963 & 1960	7,360					45.6
		Tin Fouye N. +F6, 1962	4,265					39.6
		El Borma, 1967	8,200					42.9
		Keskassa, 1968	8,860					42.9
		Mereksen, 1974	9,420					45.8
		Gara, 1962	9,420					42.9
		Hassi Messaoud N., 1956	10,500					45.9
		Hassi Messaoud S., 1956	10,500					46.1
		Gassi-Touil & Gassi-Touil E., 1961	6,890					50.6-50.8
		Hassi Chergui	8,200					50.6
		Nezla N., 1965	8,530					51.5
		Rhourde El Baguel, 1962	9,850					40.2
		Mesdar E. & W., 1972	11,155					40.3
		El Gassi-El Agreb, 1959	10,170					47.9
		Rhourde Nouss & E., 1972	8,530					39.7
		Tin Foye Tabankort, 1966	4,600- 6,560					41.1-41.3
		Djoua W., 1967	5,580- 6,240					41.1
		Amassak, 1970	6,565					41.1
		Tamendjelt, 1970	5,585- 6,890					41.1
		Timedratine, 1964	8,155					42.7
		Ohanet N. & S., 1960	7,878					43.8
		Askarene, 1962	8,200					41.7
		Guelta, 1962	8,960					41.7
		Stah, 1971	9,515					45.8
		Ras Toumb, 1976	9,190					35.7
		Haoud Berkaoui-Ben Kahla, 1965	11,000					43.6
		Guellala-Guellala N.E., 1969	11,320					42.2-42.3
		N'Goussa, 1974	11,715					42.2
		Kef El Argoub, 1973	12,570					42.2
		Oued Noumer, 1969	8,860					48.3
		Djorf, 1974	9,025					48.3
		Djebel Onk, 1960	3,940					37.0
		Alrar FJT	...					...
		Hassi R'Mel(c)	...					...
		Gassi Touil(c)	...					...
		Total Algeria		**840**	**840**	**649,000**	**7,537,780,000**	
ANGOLA	FINA ANGOLA	Benfica, 1955	8,300	...	14	...	2,267,118	30.0
		Cacuaco, 1958	7,870	1	12	26	255,153	30.0
		Galinda, 1959	7,220	...	8	...	2,245,401	30.0
		Tobias, 1961	1,970	1	12	55	28,824,501	31.0
		Mulenvos, 1966	5,900- 6,600	7	16	154	5,012,135	25.0
		Quenguela, 1968	6,000	24	58	2,089	37,131,908	31.0
		Legua, 1972	6,300	1	3	105	661,375	31.0

*This represents only Abu Dhabi's share of 50% in the field.

		Name of field, discovery date	Depth, ft	No. of wells Producing	Total	Production 1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Bento, 1972	7,350	1	5	276	4,901,014	26.0
		C. Cobra, 1969	4,000	9	15	1,068	3,012,952	41.0
		Quinguila, 1972	3,400	18	31	8,035	33,117,951	36.0
		N'Zombo, 1973	5,000- 6,300	24	37	11,302	87,556,808	33.0
		Quinfuquena, 1975	6,800- 7,100	14	18	4,659	24,271,920	32.0
		Ganda, 1975	5,000	4	5	3,046	5,842,561	36.0
		Sereia, 1974	6,200	3	4	607	1,073,417	27.0
		Lumueno, 1977	4,600	8	23	2,792	2,676,720	37.0
		Pambo, 1982	4,600	4	4	722	1,681,821	39.0
		Luango, 1977	3,800	3	6	682	1,942,609	38.0
		Pinda, 1966	6,709	...	4	8	2,824	26.0
	CHEVRON	• Malongo North, 1966	1,170- 9,250	58	73	13,411	210,363,571	30.0
		• Malongo West, 1969	1,680- 8,800	22	49	18,485	230,464,506	22.5
		• Malongo South, 1966	1,150- 1,440	29	33	9,108	72,399,649	25.0
		• Kali, 1969	11,400-11,660	...	1	288	4,222,347	30.0
		• Kungulo, 1975	4,000	16	17	10,305	43,099,612	32.2
		• Limba, 1969	2,660- 7,350	10	14	10,768	85,107,068	31.6
		• Kambala, 1971	10,500	4	5	6,389	17,552,178	32.8
		• Livuite, 1979	8,000	4	7	445	2,476,298	31.7
		• Takula, 1971	3,070- 9,090	64	72	121,883	155,574,940	31.5
		• Lifuma, 1984	7,800	...	1	...	184,404	31.4
		• Vuko, 1983	3,700	4	6	8,465	6,839,692	35.0
		• Wamba, 1982	2,700	6	7	24,969	9,113,557	29.0
		Numbi, 1980	3,446	15	15	6,358	2,320,774	34.0
	TEXACO	• Cuntala, 1978	7,200	1	3	87	2,184,064	31.0
		• Essungo, 1975	6,500	10	12	4,781	19,387,494	35.0
		Lombo Este, 1983	7,800	4	6	794	189,714	41.0
		Tubarão, 1984	7,600	4	5	1,859	678,537	41.0
		Sulele Oeste, 1985	7,600	1	1	140	51,130	41.0
	ELF ANGOLA	• Palanca, 1981	8,860	12	23	45,100	39,702,361	40.0
		• Pacassa, 1982	11,500	10	13	40,164	18,206,769	38.0
		Total Angola		**398**	**638**	**359,425**	**1,162,896,943**	
ARGENTINA(e)	**YPF**	Chubut, 1907	1,908- 9,168	2,171	2,220	426,000	4,394,925,000	21.1-26.0
		Jujuy, 1969	2,461-16,732	9	10			46.5-47.0
		La Pampa, 1968	3,609- 4,921	180	185			31.0
		Mendoza, 1932	2,178-16,778	1,087	1,113			23.7-32.0
		Neuquen, 1918	1,312-12,498	986	1,049			24.0-41.0
		Rio Negro, 1960	2,953- 7,546	794	853			22.5-41.0
		Salta, 1928	6,551-15,092	41	60			29.0-59.0
		Santa Cruz, 1946	1,468-17,060	2,935	3,014			21.1-30.0
		Tierra del Fuego, 1959	5,249- 7,824	182	196			43.4-46.0
		Formosa, 1984	11,466-11,490	4	5			42.0-42.9
		Total Argentina		**8,389**	**8,705**	**426,300**	**4,394,925,000**	
AUSTRALIA	**BARRACK ENERGY**	Mount Horner, 1965	3,800- 5,800	2	7	26	20,240	38.0
	BHP PETROLEUM PTY. LTD	• Jabiru, 1983	4,786	2	2	14,352	7,565,029	42.3
	BOND CORP., PETROLEUM DIVISION	• Harriet, 1983	6,230	10	10	10,760	6,668,000	38.2
	CSR OIL & GAS DIV. BRISBANE	Anabranch, 1965	4,188	...	1	4	13,701	44.0
		Duarran, 1964	4,105	...	1	...	14,036	37.0
		Maffra, 1965	4,251	1	2	17	28,086	48.0
		Richmond, 1963	3,643	...	1	2	16,345	43.0
		Snake Creek, 1964	4,990	...	1	4	12,658	67.0
		Sunny Bank, 1962	6,139	...	1	...	706	40.0
		Trinidad, 1965	4,599	...	2	3	63,446	46.0
	ESSO-BHP	• Barracouta, 1965	4,550	2	2	3,690	33,277,000	62.8
		• Marlin, 1966	5,100	1	4	11,410	54,629,500	50.0
		• Kingfish, 1967	7,500	26	37	43,440	934,636,400	46.9
		• Halibut, 1967	7,700	10	17	64,290	689,006,000	43.3
		• Mackerel, 1969	7,700	18	18	80,790	347,077,800	45.6
		• Tuna, 1968	6,500	20	22	6,780	32,786,700	40.5
		• Snapper, 1968	4,350	16	21	4,710	11,906,400	47.0
		• Cobia, 1972	7,700	10	12	49,620	65,075,900	44.6
		• West Kingfish, 1968	7,500	15	18	41,800	46,622,780	46.9
		• Fortescue, 1978	7,700	23	25	91,930	142,895,000	43.0
		• Flounder, 1968	8,200	8	10	16,960	13,271,900	46.7
	HARTOGEN GROUP	Koorocpa, 1985	3,300	1	1	9	12,312	42.0
		Talgeberry, 1985	3,900	3	3	356	217,882	46.0
		Washpool, 1985	5,250	1	1	4	715	35.0
		Toobunyah, 1985	3,500	5	5	300	198,683	43.0
		Takyah, 1985	3,800	2	2	11	8,708	43.0
		Ipundu, 1986	2,700	1	1	77	44,129	43.0
		Borah Creek, 1982	4,900	1	3	36	11,584	34.0
		Kincora, 1980	4,700	2	2	33	296,342	34.0
		Sandy Creek, 1982	4,900	1	1	4	8,685	34.0

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Waratah, 1982	5,350	4	4	71	262,047	34.0
	Tintaburra, 1984	3,500	6	6	449	424,864	43.0
	Monlor, 1987	4,150	1	1	68	5,875	49.0
	Cranstoun, 1987	4,250	1	1	140	4,071	48.0
HOME ENERGY	Blina, 1981	4,300	6	6	438	1,058,202	37.0
	Sundown, 1983	3,600	4	4	65	165,626	39.0
	West Terrace, 1985	3,800	1	1	55	105,686	33.0
	Lloyd, 1987	4,806	1	1	94	14,419	37.0
LASMO	Bodalla South, 1984	4,800- 5,230	6	6	2,425	2,758,481	47.2-48.7
	Kenmore, 1985	4,600- 4,980	9	9	2,639	1,959,951	48.2-45.8
	Black Stump, 1986	5,360	1	1	126	118,373	45.2
	Glenvale, 1985	3,800	1	1	37	17,834	49.3
SANTOS LTD.	Jackson, 1981	4,750	32	32	16,354	18,834,000	40.0-48.0
	Jackson South, 1982	4,800	6	6	1,144	1,884,000	40.8
	Chookoo, 1985	6,000	3	3	306	245,000	45.0
	Wilson, 1983	5,000	5	5	458	526,000	40.0
	Naccowlah South, 1983	6,000	7	7	914	2,069,000	40.0-46.0
	Gunna, 1983	6,000	1	1	37	71,000	40.0
	Tinpilla, 1983	6,000	1	1	38	66,000	40.0
	Naccowlah West, 1983	5,700	8	8	1,195	1,546,000	40.0
	Bogala, 1984	6,900	2	2	159	244,000	40.0
	Yanda, 1984	8,000	1	1	92	41,000	40.0
	Mooliampah, 1985	6,000	1	1	76	64,000	40.0
	Watson South, 1985	5,500	1	1	825	511,000	40.0
	Sigma, 1983	5,700	2	2	132	71,000	40.0
	Tickalara, 1984	5,600	4	4	291	149,000	40.0
	Big Lake, 1984	6,600	2	2	298	280,000	45.0-48.0
	Gidgealpa, 1984	6,150	10	11	1,809	2,004,000	45.0-50.0
	McKinlay, 1985	5,100	1	1	36	26,000	41.0
	Strzelecki, 1978	5,800	16	16	4,518	11,305,000	43.0-49.0
	Dullingari, 1979	5,200	16	17	3,787	6,587,000	54.0
	Narcoonowie, 1983	6,000	2	2	134	118,000	52.0-53.0
	Limestone Creek/Biala, 1984	5,100	9	9	1,454	992,000	41.0
	Wancoocha, 1984	6,000	5	5	818	1,060,000	44.0-54.0
	Muteroo, 1985	6,000	3	3	1,785	1,512,000	45.0
	Spencer, 1986	6,500	4	5	1,038	468,000	47.0
	Jena, 1985	5,200	1	1	83	56,000	41.0
	Alwyn, 1985	5,200	1	1	127	77,000	41.0
	Merrimelia, 1983	...	9	9	1,252	2,507,000	...
	Meranji, 1985	...	3	3	401	317,000	...
	Bookabourdie, 1985	...	2	2	116	48,000	...
	Dirkala, 1986	7,000	1	1	697	474,000	56.0
	Nungaroo, 1985	4,150	1	1	74	39,000	40.0
	Ulandi, 1985	5,200	1	1	63	62,000	40.4
	Watson, 1985	...	2	2	206	64,000	...
	Cooroo/Cooroo North, 1986	...	3	3	1,438	473,000	...
	Challum, 1983	...	1	1	19	13,000	...
	Kerinna, 1984	4,300	1	1	29	15,000	41.0
	Kercummura, 1985	...	...	...	...	1,000	50.8
	Cook, 1985	...	...	...	25	23,000	...
	Toby, 1987	...	1	1	5	1,000	...
	Dingera, 1987	...	1	1	NA	...	...
	Pitchery, 1988	...	1	1	NA	...	...
	Munro, 1988	...	1	1	NA	...	...
	Naccowlah East, 1988	...	1	1	NA	...	...
	Mawson, 1987	...	1	1	173	51,000	...
	Pintari North, 1988	...	1	1	NA	...	...
	Taloola, 1988	...	2	2	NA	...	...
	Sturt, 1988	...	1	1	NA	...	...
	Tantanna, 1988	...	3	3	NA	...	...
	Tirrawarra, 1970	9,500	28	35	4,770	7,685,227	52.0
	Moorari, 1971	7,705- 9,400	5	6	615	1,163,619	46.9
	Fly Lake, 1971	9,300	1	3	94	469,454	53.0
	Brolga, 1983	9,547	1	1	39	45,211	53.0
	Woolkina, 1982	9,700	1	1	26	98,546	51.5
TMOC RESOURCES LTD.	Moonie, 1961	5,800	27	36	658	21,679,619	44.5
	Alton, 1964	6,000	...	9	26	1,890,105	49.5
	Bennett, 1965	5,960	1	2	5	115,704	45.0
	Cabawin, 1961	10,800	1	1	6	59,972	49.0
	Mereenie, 1964	4,000	24	36	2,581	3,209,269	48.9
WAPET GROUP	Barrow Island, 1964	1,200- 6,700	407	516	17,447	224,561,262	37.7
	Dongara, 1969	5,250- 5,577	5	9	111	927,370	35.5
WOODSIDE	North Rankin,[c] 1972	9,800	8	13	14,820	10,374,000	52.3
BRIDGE OIL LTD.[a]	Thomby Creek, 1979	5,180	...	4			50.0
	Yellow Bank Creek, 1982	5,064	2	3			52.0
	Louise, 1986	5,900	1	2			59.0
	Narrows, 1986	5,740	1	1			59.0
PANCONTINENTAL PETROLEUM LTD.[a]	Nockatunga, 1983	5,420	4	5	18,372	7,357,000	49.6
	Winna, 1985	4,526	1	1			46.3

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Koora, 1985	4,822	1	2			41.7
		Thungo, 1986	4,670	1	1			45.7
		Kihee, 1986	3,200	1	1			44.7
	STRATA OIL[e]	Woodada,[c] 1980	7,400	...	...			54.0
	WESTERN MINING CORP.	North Herald, 1982	3,937	1	1	...	15,914	44.0
		South Pepper, 1982	4,036	1	1	...	345	44.0
		Total Australia		**928**	**1,148**	**550,000**	**2,737,768,713**	
AUSTRIA	**MOBIL**	Voitsdorf, 1963	7,000	18	36	398	21,568,397	36.0
		Sattledt, 1971	5,700	12	20	441	5,023,043	37.0
		Kemating, 1979	6,100	8	9	940	3,675,281	34.0
		Gaiselberg, 1938	5,200	32	71	774	32,123,128	27.0
		Other	...	88	117	1,596	26,108,744	32.0
	OEMV	Hochleiten, 1977	3,100- 5,000					21.3
		Matzen, 1949	6,100					25.7
		Pirawarth, 1957	1,600- 6,500	1,040	1,040	15,795	571,329,890	28.4
		St. Ulrich, 1938	1,600- 4,300					31.1
		Other	...					...
		Total Austria		**1,198**	**1,293**	**19,944**	**659,828,483**	
BAHRAIN	**BANOCO**	Awali, 1932	1,850- 4,600	274	374	39,290	784,000,000	33.0
		Total Bahrain		**274**	**374**	**39,290**	**784,000,000**	
BARBADOS	**BARB. NOC**	Woodbourne, 1966	1,665- 6,701	80	135	1,361	4,590,303	27.0
		Total Barbados		**80**	**135**	**1,361**	**4,590,303**	
BENIN[e]	**PAN OCEAN**	Seme, 1968	6,232	6	6	5,300	11,529,000	22.6
		Total Benin		**6**	**6**	**5,300**	**11,529,000**	
BOLIVIA	**YPFB**	Camiri, 1927	3,936	45	54	485	48,286,707	55.0
		Carand, 1960	3,940	33	37	349	54,114,187	60.0
		Colpa, 1961	9,184	15	15	238	18,168,729	65.0
		Monteagudo, 1966	4,592	25	29	1,600	31,531,126	41.0
		La Pena, 1965	8,856	17	23	4,734	24,974,160	43.0
		Palmar, 1964	10,758	6	6	93	1,686,528	65.0
		Rio Grande, 1961	9,512	37	37	2,604	59,966,393	62.0
		Vuelta Grande, 1978	8,220	6	12	1,050	1,791,995	67.0
		Espino, 1979	14,655	1	3	61	964,698	56.2
		San Roque, 1981	7,170	5	6	726	417,724	71.0
		Santa Cruz, 1986	9,350	5	11	1,524	1,099,149	65.0
		H. Suarez R., 1982	7,820	2	5	140	474,547	35.0
		Villamontes, 1987	9,770	2	4	429	156,668	57.0
		Other	...	79	79	683	30,785,458	...
	OCCIDENTAL	Tita, 1976	6,450	10	15	171	4,332,766	67.9
		Porvenir, 1978	9,600	6	9	2,881	10,330,669	60.5
	TESORO BOLIVIA	La Vertiente, 1977	15,230	6	7	1,110	4,065,393	64.1
		Escondido, 1980	11,293	...	3	...	...	60.0
		Taiguati, 1981	10,174	...	1	...	...	63.0
		Los Suris, 1981	13,577	...	1	...	...	50.0
		Total Bolivia		**300**	**357**	**18,878**	**293,146,897**	
BRAZIL	**ALAGOAS**	Furado, 1969	4,440- 5,500	50	58	2,315	13,793,400	35.0
		Pilar, 1981	4,100- 5,100	73	78	6,820	9,695,800	40.0
		Tabuleiro de Martins, 1957	3,900- 4,950	27	28	460	3,835,000	27.0
		• Mero, 1974	6,500- 7,400	...	...	...	150,950	35.0
		Other	...	20	24	350	1,769,400	...
	AMAZONAS	Igarape Cuia, 1985	3,600- 3,700	...	1	...	25,250	41.0
		Rio Urucú, 1986	7,500- 8,300	...	...	...	...	44.0
	BAHIA	Agua Grande, 1951	820- 4,265	129	135	5,220	273,575,800	40.0
		Aracas, 1965	3,280- 8,856	170	172	7,080	109,178,300	41.0
		Buracica, 1959	1,476- 1,840	222	225	6,910	135,632,600	35.0
		Faz. Imbe, 1964	2,130- 5,575	65	70	1,825	14,686,100	40.0
		Faz. Boa Esperanca, 1966	7,215- 8,036	19	22	640	1,510,300	39.0
		Faz. Panelas, 1962	2,400- 5,100	13	14	400	6,415,300	37.0
		Malombe, 1966	3,280	18	21	430	6,824,600	41.0
		Mata/Remanso, 1971	4,445- 4,560	77	91	60	19,498,400	35.0
		Miranga, 1965	3,280- 3,936	228	232	9,670	186,914,000	40.0
		Rio Dos Ovos, 1979	2,410- 3,750	13	16	350	1,901,200	35.0
		Santana, 1962	2,400- 4,000	7	7	240	5,533,700	37.0
		Sesmaria, 1963	3,100- 4,600	38	39	900	2,847,600	40.0
		Candeias, 1941	3,280- 7,415	36	36	2,770	77,415,500	30.0
		Cassarongongo, 1959	1,475- 4,755	80	86	1,300	14,484,800	32.0

			No. of wells		Production		
	Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Dom Joao Terra, 1947	920- 1,350	71	71	900	20,336,800	38.0
	Riacho da Barra, 1982	2,910- 3,998	58	58	4,120	10,410,900	39.0
	Taquipe, 1958	3,115- 3,935	107	108	4,790	84,255,600	40.0
	● Candeias Mar, 1941	3,300- 7,400	...	15	490	6,889,200	30.0
	● Dom Joao Mar, 1947	920- 3,000	293	296	4,440	81,049,100	38.0
	● Ilheus, 1979	1,500	...	...	...	895,470	41.0
	Cexis, 1983	1,670- 5,230	21	23	1,940	2,944,800	30.0
	Faz. Balsamo, 1983	2,500- 4,000	141	153	8,250	6,254,300	31.0
	Rio Pojuca, 1982	5,600- 6,200	25	25	1,780	3,653,300	35.0
	Faz. Alvorada, 1983	2,100- 4,900	81	92	6,110	4,644,300	31.0
	Rio do Bú, 1984	2,900- 3,000	42	48	2,570	1,730,300	33.0
	Other	...	165	170	610	20,912,200	...
CEARÁ	Faz. Belem, 1980	1,150- 2,500	286	295	2,220	4,008,100	13.0
	● Curima, 1978	6,888	16	17	6,240	17,046,400	32.0
	● Xareu, 1977	5,717- 5,766	27	28	3,600	13,478,200	39.0
	● Atum, 1983	5,800- 6,750	9	10	3,590	6,715,500	25.0
	● Espada, 1983	5,750- 6,900	6	6	1,770	3,382,700	26.0
ESPIRITO SANTO	Faz. Cedro, 1962	5,248	31	33	1,160	9,683,000	28.0
	Sao Mateus, 1969	5,750	78	81	1,490	4,090,750	27.0
	Lagoa Parda, 1977	5,576	43	44	3,780	20,621,250	30.0
	Rio Itaunas, 1977	5,400	41	43	1,080	3,326,300	28.0
	● Cacao, 1978	9,184	4	5	1,030	8,493,000	32.0
	Lagoa Suruaca, 1982	6,400	15	24	1,530	4,516,300	30.0
	Lagoa Piabanha, 1984	6,500	7	11	640	1,564,750	27.0
	Rio Preto/Oeste/Sul, 1976	...	38	40	880	1,813,600	...
	Other	...	67	72	1,820	1,997,740	...
RIO DE JANEIRO	● Enchova, 1976	6,973- 7,885	20	26	31,010	72,174,800	23.0
	● Bonito, 1977	6,950- 8,000	14	17	10,500	28,425,200	27.0
	● Garoupa, 1974	11,382	16	20	21,780	62,421,500	30.0
	● Namorado, 1975	10,083	34	42	62,510	189,920,000	28.0
	● Garoupinha, 1974	12,693	3	4	4,040	10,416,000	30.0
	● Pampo, 1977	6,215	27	32	58,640	93,758,300	21.0
	● Area RJS-236 Trilha, 1983	8,800-11,000	4	4	5,210	9,094,000	28.0
	● Linguado, 1981	9,000-11,000	12	15	31,715	53,547,300	20.0
	● Badejo, 1981	8,500-10,500	10	12	7,760	15,694,300	28.0
	● Bicudo, 1982	8,000-11,000	10	12	11,510	31,208,100	22.0
	● Corvina, 1983	9,000-11,000	7	8	17,920	24,591,400	25.0
	● Pirauna, 1982	8,000-10,500	7	9	12,470	20,957,600	27.0
	● Sul de Pampo, 1978	9,300- 9,600	...	...	...	...	20.0
	● Cherne, 1982	9,900-10,200	19	23	31,660	39,985,100	27.0
	● Bagre, 1983	8,700- 9,000	8	10	6,010	4,501,400	25.0
	● Parati, 1982	8,900- 9,200	3	5	1,590	4,714,200	25.0
	● Viola, 1981	9,200- 9,900	7	8	6,915	8,050,900	26.0
	● Marimba, 1983	[illegible]900- 9,200	3	5	12,970	5,866,800	28.0
	● Anequim, 1981	8,200- 8,500	3	3	2,540	3,181,400	27.0
	● Area [illegible]S-150	...	...	...	...	296,070	26.0
	● Moreia, 1984	8,200- 9,500	6	6	4,640	1,716,900	22.0
	● Albacora, 1984	8,430	4	15	2,083	760,500	26.0
RIO GRANDE DO NORTE	Alto do Rodrigues, 1981	990- 1,120	290	302	4,410	5,845,400	18.0
	● Ubarana, 1973	7,216- 8,365	87	89	18,050	47,159,500	40.0
	● Agulha, 1975	5,412	4	4	365	6,380,000	33.0
	Estreito/Rio Panon, 1983	650- 820	441	4[illegible]	5,600	8,424,100	16.0
	Macau/Terra, 1982	3,000- 3,300	2	12	150	712,250	31.0
	Lorena, 1984	1,200- 1,700	18	20	890	593,500	28.0
	Upanema, 1985	1,110- 1,800	16	24	1,700	1,574,000	28.0
	● Area 1-RNS-36, 1982	...	...	...	...	178,290	32.0
	● Macau-Mar, 1986	3,000	5	5	200	372,750	31.0
	Faz. Pocinho, 1982	1,450- 2,000	191	202	4,705	8,669,700	35.0
	Palmeiras, 1982	1,450- 1,800	...	...	...	...	25.0
	Serraria, 1982	3,200- 3,900	36	37	1,625	2,298,500	27.0
	Guamaré, 1983	1,400- 1,600	32	36	600	1,435,400	25.0
	Canto do Amaro, 1986	2,500- 3,600	114	128	6,015	2,550,700	25.0
	Livramento, 1986	2,500- 3,300	31	33	5,100	2,324,100	41.0
	Other	...	81	96	200	419,000	...
PARÁ	● Área 1-PAS-11, 1983	...	...	...	...	421,300	41.0
MARANHÃO	São João, 1983	4,950- 6,200	4	5	30	72,060	40.0
SERGIPE	Atalàia Sul, 1961	1,450	5	7	100	2,679,500	24.0
	Carmopolis, 1963	2,460	771	798	23,700	161,371,000	24.0
	Riachuelo, 1961	1,475	239	245	3,840	20,501,800	28.0
	Siririzinho, 1967	1,640	187	196	5,790	34,408,000	30.0
	● Caioba, 1969	6,232- 6,890	12	12	2,490	29,573,700	36.0
	● Camurim, 1970	6,232	48	50	5,000	15,359,200	25.0
	● Dourado, 1970	3,620- 3,635	5	5	1,010	3,955,000	36.0
	● Guaricema, 1968	3,335- 4,430	12	12	4,480	35,025,500	41.0
	● Robalo, 1973	3,300- 4,500	4	5	130	818,600	30.0
	Brejo Grande, 1967	1,670	12	13	625	1,735,200	26.0
	Other	...	88	93	1,420	3,506,080	...
	Total Brazil		**5,808**	**6,277**	**556,288**	**2,310,047,880**	

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
BRUNEI	SHELL	● Fairley, 1969	10,740	37	54	13,157	107,200,000	40.0
		● Ampa SW, 1963	7,068- 8,155	98	219	43,694	515,500,000	41.0
		● Magpie, 1975	...	16	23	17,718	66,900,000	31.0
		● Champion, 1970	4,300	106	210	39,846	285,800,000	23.0
		Seria, 1929	...	346	585	20,277	973,300,000	34.0
		Rasau, 1929	...	5	9	4,508	4,100,000	30.0
		Other	...	...	...	...	13,000,000	...
		Total Brunei		**608**	**1,100**	**139,200**	**1,965,800,000**	
BURMA(e)	MYANMA	Chauk-Lanywa, 1902	1,500- 4,000	450	450	19,000	489,685,000	36.0
		Mann, 1970	1,600- 7,000					37.5
		Myanaung, 1964	2,000- 4,000					40.5
		Prome, 1965	850- 5,000					36.0
		Yenangyaung, 1902	100- 6,700					36.0
		Total Burma		**450**	**450**	**19,000**	**489,658,000**	
CAMEROON	ELF(e)	● Betika, 1972	5,300	166	170	167,619	364,898,935	42.5
		Ekoundou S., 1975	6,200					24.0
		Kole, 1974	5,500					31.0
		Kombo Center, 1976	5,900					37.0
		Kombo North, 1978	7,200					35.0
		Ekoundou Horst plus Center, 1972	7,200					29.0
		Boa, 1976	5,900					35.0
		Bavo South, 1976	5,600					29.3
		Betika S. Marine, 1979	6,300					30.0
		Ekuondou N. Marine, 1977	5,250					36.0
		Mokoko NE plus Abana, 1977	4,600					29.0
		Asoma Marine, 1973	3,600					19.0
		Kita E. Marine, 1978	6,900					40.8
		Mokoko S. Marine, 1977	3,300					17.0
		Inova Marine, 1976	6,200					32.8
	TOTAL-CFP	● Moudi, 1979	5,250- 5,900	4	4	4,088	9,632,140	40.0
		● Moudi D., 1980	3,300	5	5	2,293	2,336,836	21.3
		Total Cameroon		**175**	**179**	**174,000**	**376,867,911**	
CANADA	ALBERTA	Acheson, 1950	3,390	62	118	12,986	120,066,226	38.0
		Bantry, 1940	2,574- 3,300	150	184	6,647	46,537,461	...
		Bellshill Lake, 1955	2,950	419	432	12,980	58,646,234	...
		Bonnie Glen, 1952	3,959- 6,779	144	170	23,229	496,104,770	34.0-44.0
		Carson Creek N., 1958	8,787- 8,935	41	74	9,967	136,947,486	44.0
		Cessford, 1950	2,800- 3,028	196	272	3,523	29,739,639	...
		Clive, 1951	6,074- 6,208	120	169	5,436	49,182,090	...
		Countess, 1951	2,858- 4,272	116	148	7,258	61,650,607	...
		Fenn-Big Valley, 1950	3,900- 5,400	145	318	18,300	312,219,206	32.0
		Gilby, 1962	4,201- 7,000	85	155	3,116	46,423,510	...
		Golden Spike, 1949	3,570- 5,961	69	84	2,371	180,961,066	36.0
		Harmattan East	...	87	149	4,131	70,926,216	...
		Harmatton Elkton, 1955	8,796-10,757	62	76	4,581	60,444,189	...
		Innisfail, 1956	6,730- 8,440	33	74	5,752	73,761,997	...
		Joarcam, 1949	3,179	204	288	5,382	100,259,782	...
		Joffre, 1953	4,983- 6,779	88	167	3,892	81,882,361	...
		Judy Creek, 1951	8,307- 8,701	190	266	18,915	388,265,226	43.0
		Kaybob, 1957	4,870- 9,577	56	88	5,856	100,629,149	...
		Kaybob S., 1958	5,600-10,042	71	100	9,592	76,445,982	...
		Leduc-Woodbend, 1947	3,062- 5,380	348	737	4,604	375,198,288	40.0
		Lloydminster, 1933	1,690- 1,945	500	836	5,863	47,200,642	...
		Medicine River, 1954	5,435- 7,600	246	347	10,22[illegible]	67,323,063	...
		Mitsue, 1964	5,908	250	386	25,[illegible]01	271,263,665	43.0
		Nipisi, 1965	5,648- 5,726	244	340	31,912	263,581,751	41.0
		Pembina, 1953	3,000- 6,133	3,315	4,055	93,541	1,204,156,195	32.0-37.0
		Provost, 1946	2,760- 2,898	949	1,308	17,938	70,388,031	...
		Rainbow, 1965	4,994- 6,160	261	339	48,992	497,656,724	38.0-42.0
		Rainbow South, 1965	6,102- 6,400	50	81	7,029	62,063,923	...
		Red Earth, 1956	4,184- 4,878	174	259	4,942	36,024,951	...
		Redwater, 1948	2,012- 3,200	587	848	15,145	784,068,674	35.0
		Simonette, 1958	10,500	33	46	2,460	37,367,554	...
		Snipe Lake, 1962	8,500	48	95	3,785	52,574,155	...
		Sturgeon Lake S., 1953	4,912- 8,471	92	146	15,992	137,010,616	37.0
		Sundre, 1954	8,700- 9,000	54	69	3,182	35,791,800	...
		Swan Hills, 1957	8,100	589	820	40,545	667,109,678	40.0
		Swan Hills S., 1959	8,400	178	198	18,009	338,479,554	...
		Turner Valley, 1913	3,100- 9,150	101	158	2,655	138,926,474	39.0
		Utikuma Lake, 1963	5,624	104	138	4,461	43,380,838	...
		Virginia Hills, 1957	9,210	126	183	16,958	141,966,553	34.0
		Wainwright, 1925	1,903- 2,200	617	760	9,684	65,562,771	...
		Westerose, 1952	6,818	28	35	15,048	125,517,746	...
		Willisden Green, 1956	5,157	572	797	9,416	114,056,076	...
		Wizard Lake, 1951	4,044- 5,973	38	48	14,372	318,444,912	...

		Name of field, discovery date	Depth, ft	No. of wells — Producing	No. of wells — Total	Production — 1987 average B/d	Production — Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Zama	3,702	136	242	5,914	73,391,284	33.0-37.0
		Other	...	8,770	13,103	358,948	1,501,088,849	...
	BRITISH COLUMBIA	Boundary Lake, 1957	3,418- 4,575	287	348	11,171	167,805,481	40.0
		Other	...	391	829	24,749	253,385,577	...
	MANITOBA	All fields	...	1,434	1,624	13,479	161,286,112	...
	SASKATCHEWAN	Steelman, 1950	4,600	660	721	9,188	251,994,739	...
		Weyburn, 1955	4,600	809	878	17,793	280,897,407	...
		Other	...	12,378	16,144	180,528	1,647,494,821	...
	ONTARIO	All fields	...	1,175	1,494	2,293	61,049,607	...
	NEW BRUNSWICK	All fields	...	...	...	9	802,951	...
	NORTHWEST TERRITORIES	All fields	...	...	...	26,413	54,571,770	...
		Total Canada		**37,882**	**51,744**	**1,236,553**	**12,830,976,429**	
CHILE	**ENAP MAINLAND**	Canadon, 1962	6,090	13	63	236	14,468,812	38.4
		Daniel, 1960	5,806	4	119	165	34,434,471	25.4
		Daniel Este, 1961	5,523	5	64	490	28,311,574	25.0
		Dungeness, 1962	5,251	3	19	107	3,915,136	28.6
		Posesion, 1960	5,622	33	75	838	21,176,251	63.6
		Other	...	22	120	2,336	22,192,977	...
	TIERRA DEL FUEGO	Calafate, 1955	6,045	13	61	1,008	25,561,355	49.3
		Catalina Sur, 1961	5,779	4	43	25	6,360,443	44.0
		Cullen, 1954	5,730	16	107	382	40,980,042	41.8
		Tres Lagos, 1957	5,724	18	84	366	15,826,176	40.1
		Catalina, 1956	5,756	10	26	1,788	6,204,654	38.7
		Gorrión, 1986	6,025	6	6	947	375,381	39.0
		San Sebastián Norte, 1986	6,870	4	4	227	87,726	37.0
		Other	...	33	255	1,538	57,773,725	...
	STRAIT OF MAGELLAN	Ostion, 1977	7,156	15	18	1,468	7,724,254	33.0
		Posesion, 1977	6,727	12	39	1,102	5,169,663	34.5
		Spiteful, 1977	6,298	35	82	5,036	41,014,552	34.5
		Spiteful Norte, 1978	7,150	13	55	799	9,213,168	39.0
		Daniel Este-Dungeness, 1977	6,126	28	36	3,140	3,423,262	35.9
		Pejerrey, 1984	7,229	36	75	7,855	8,274,097	39.0
		Jaiba, 1978	6,650	2	2	871	25,251	46.5
		Total Chile		**325**	**1,353**	**30,724**	**352,512,970**	
CHINA(e)	**WESTERN REGION: JUNGGAR BASIN, TARIM BASIN, TURPEN BASIN**	Karamay, 1955	...	...	...			...
		Dushanzi, 1941	...	...	...			...
		Other	...	...	...			...
	CENTRAL REGION: JIUQUAN BASIN	Yumen, 1938	...	...	...			...
	CENTRAL REGION: SICHUAN BASIN	All fields	...	...	...			...
	CENTRAL REGION: SHAN-GAN-NING BASIN	Chang Qing, 1978	...	...	...			...
		Yanchang, 1907	...	...	...			...
	CENTRAL REGION: QAIDAM BASIN	Qinghai, 1955	...	...	...			...
		Lenghu 3,4,5, 1958	...	...	...			...
		Other	...	...	...			...
	EASTERN REGION: SONGLIAO BASIN	Daqing, 1959	...	39,500	NA	2,682,000	12,695,513,000	...
		Fuyn, 1958	...	...	...			...
		Jilin, 1978	...	...	...			...
	EASTERN REGION: BOHAI BASIN	Shengli, 1962	...	...	...			...
		Renqiu, 1975	...	...	...			...
		Liaohe, 1964	...	...	...			...
		Dagang, 1964	...	...	...			...
		Zhongyuan, 1981	...	...	...			...
		Itu, 1970	...	...	...			...
	EASTERN REGION: HAN[illegible]AN BASIN	Qianjiang, 1966	...	...	...			...
		Other	...	...	...			...
	EASTERN REGION: NANXIANG BASIN	Nanyang, 1971	...	...	...			...
	EASTERN REGION: SUBEI BASIN	All fields	...	...	...			...
		Total China		**39,500**	**NA**	**2,682,000**	**12,695,513,000**	
CHINA, TAIWAN	**CHINESE PETROLEUM**	Tiechengshan,(c) 1959	...	25	33	1,060	15,306,500	51.0
		Chingtsohu,(c) 1967	...	5	18	48		50.0
		Yunghoshan,(c) 1971	...	23	33	270	6,301,067	45.0
		Chuhuangkeng,(c) 1960	...	24	26	146	-	50.0
		• CBK,(c) 1986	...	4	9	1,089	417,981	47.0
		Total China, Taiwan		**81**	**119**	**2,813**	**22,025,548**	

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
COLOMBIA	ECOPETROL[e]	Galán, 1945	3,200	62	71			19.0
		Infantas, 1918	3,200	263	307			25.8
		La Cira, 1925	3,250	612	703			24.0
		Lis-Nutria, 1957	9,500	130	137			31.0
		Llanito, 1960	7,300	60	61			21.0
		Cantagallo, 1941	6,800	11	13			19.7
		Casabe, 1941	3,800	330	416			20.7
		Yarigui, 1954	8,700	58	59			19.5
		Boquete, 1961	8,000	12	20			43.0
		Cicuco, 1956	...	5	22	76,988	1,954,497,703	...
		Petrolea, 1933	...	6	21			...
		Tibú, 1940	...	189	261			...
		Ortega, 1951	...	6	6			28.0
		Apiay, 1981	10,500	9	22			23.0
		Orito, 1963	6,600	58	95			40.0
		Other	...	129	215			...
	SHELL[e]	Sta. Rosa, 1984	...	1	1			...
	A[illegible]Y	Bourdine, 1974	11,000	2	4	679	3,069,634	26.7
		Máxime, 1976	11,000	1	1	2	111,911	11.0
		Nancy, 1974	11,000	1	1	312	1,880,073	26.0
	ESSO COLOMBIANA LTD.	Bonanza, 1963	4,000	17	17	858	12,727,667	30.0
		Provincia, 1962	8,000	98	98	15,059	156,221,504	33.0
		Arauca, 1980	18,000	3	3	2,210	4,473,706	41.0
		Other	...	...	...	...	667,000	...
	HOCOL (TENNECO)	Dina K, 1969	6,500	23	30	8,632	26,702,576	22.0
		Dina T, 1962	3,600	47	58	4,965	19,933,643	20.0
		Palogrande, 1971	6,500	24	32	7,802	16,533,954	20.0
		Cebu, 1981	6,500	8	10	2,240	4,348,329	19.0
		Brisas, 1973	4,200	4	5	797	4,494,143	23.5
		Pijao, 1981	7,000	6	7	734	3,483,747	21.0
		Hato Nuevo, 1984	6,900	3	4	545	1,421,601	36.0
		Tello, 1972	7,500	27	33	7,447	38,818,837	22.0
		La Canada, 1966	700	5	7	133	1,051,654	22.0
		San Francisco, 1985	2,800	33	35	13,286	9,844,179	27.0
		Tenay, 1985	11,500	2	2	2,180	1,403,466	36.3
		Loma Larga, 1985	3,500	1	1	44	24,857	22.4
		La Jagua, 1986	5,300	1	1	141	128,625	22.0
		Santa Clara, 1987	2,100	1	1	163	14,350	19.0
	ELF	Trinidad, 1974	9,000	3	3	2,678	2,980,624	32.4
		Barquerena, 1982	9,300	2	2	1,879	2,382,765	32.3
		Cano Garza Norte, 1983	7,900	2	2	798	1,366,054	40.2
		Cano Garza, 1979	7,900	3	3	560	929,196	40.2
		Tocaria, 1980	13,500	2	2	829	548,661	32.1
		Cravo Sur, 1982	10,600	2	2	2,056	1,790,917	40.2
		Gloria Norte, 1983	12,100	1	2	632	551,144	17.2
		Cravo Este, 1987	11,376	1	1	10	3,481	42.0
	OCCIDENTAL	Payoa, 1962	8,000	24	39	1,067	69,319,875	27.0
		La Salina, 1936	2,500	49	71	2,868	12,438,352	28.0
		Caño Limón, 1983	7,600	36	38	182,875	107,666,248	29.4
		Redondo, 1984	7,600	3	3	9,410	291,708	30.2
	TEXACO	Cocorná, 1963	2,100	44	54	2,392	13,171,138	12.0-13.0
		Tisquirama, 1963	8,000	5	6	467	4,668,322	16.0-28.0
		Velasquez, 1946	7,500	119	144	4,130	164,756,697	19.0-24.0
	TEXACO-ECOPETROL	Teca, 1981	2,100	139	154	13,768	19,649,607	12.0-13.0
		Nare, 1981	2,100	4	6	152	237,107	11.0-12.0
		Los Angeles, 1983	6,400	2	4	464	350,905	14.0-15.0
		Other	...	3	20	41	4,260,355	11.2-26.1
	CHEVRON	Castilla, 1969	6,500	17	18	11,250	20,395,052	13.5
		Chichimene, 1969	6,500	1	1	557	393,556	21.3
	LASMO	Santiago, 1985	9,600	2	2	1,200	693,000	29.0
		Total Colombia		**2,711**	**2,438**	**385,300**	**2,690,832,415**	
CONGO	AGIP	• Loango, 1972	3,000	52	62	23,960	81,500,000	26.8
	ELF CONGO	• Emeraude, 1969	820	93	98	22,000	160,000,000	22.3
		• Likouala, 1972	4,270	28	42	17,800	51,000,000	33.1
		• Yanga, 1979	2,950	48	63	20,700	62,000,000	29.4
		• Sendji, 1973	3,940	49	75	34,900	44,000,000	29.5
		Pointe Indienne, 1959	4,460	3	3	180	7,000,000	36.9
		Mengo, 1979	6,500	3	3	180	600,000	34.0
		Kunsi, 1983	4,000	2	2	130	500,000	35.8
		• Tchibouela, 1983	2,100	11	12	3,200	1,100,000	28.0
		Total Congo		**289**	**360**	**123,000**	**407,700,000**	

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
DENMARK	DUC	● Dan, 1971	6,000- 6,400	...	...	21,236	38,584,436	30.7
		● Gorm, 1971	6,500- 7,000	...	...	25,842	67,044,548	34.7
		● Skjold, 1977	5,000	...	...	20,897	26,503,654	29.6
		● Rolf, 1981	...	...	...	10,923	6,935,733	37.7
		● Tyra,[c] 1986	...	...	...	14,523	11,510,668	56.6
		Total Denmark		...	...	**93,421**	**150,579,039**	
DUBAI[e]	DUPETCO	● Fateh, 1966	7,900- 9,000	141	156	377,600	1,922,775,000	31.8
		● S.W. Fateh, 1970	7,500- 9,000					30.3
		● Falah, 1972	8,100					25.5
		● Rashid, 1973	9,400-11,500					38.0
	ARCO	Margham, 1981	11,200	9	14			43.5
		Total Dubai		**150**	**179**	**377,600**	**1,922,775,000**	
ECUADOR	TEXACO-CEPE	Lago Agrio, 1967	9,600- 9,900	20	35	4,605	107,874,969	28.5
		Sacha, 1969	8,700- 9,800	91	101	34,440	337,853,986	28.0
		Shushufindi, 1969	8,800- 9,200	48	61	66,322	494,732,056	30.0
		Aguarico, 1969	9,000- 9,300	4	10	3,286	42,352,887	27.2
		Auca, 1970	8,900-10,100	21	23	8,842	64,868,855	28.0
		Auca Sur, 1980	9,100-10,300	2	2	453	1,138,109	25.6
		Atacapi, 1968	9,200- 9,500	4	5	774	11,567,397	31.0
		Parahuacu, 1968	8,700- 9,600	1	5	503	6,036,575	30.0
		Yuca, 1970	9,500- 9,900	5	7	1,965	10,192,208	25.2
		Yuca Sur, 1979	9,600-10,000	1	1	70	880,500	14.5
		Yulebra, 1980	8,800-10,000	2	2	964	2,193,240	24.3
		Culebra, 1973	8,800-10,000	2	2	418	1,707,251	15.2
		Cononaco, 1972	9,700-10,200	11	11	8,149	20,743,356	33.3
		Dureno, 1969	8,900-10,000	1	1	373	666,428	31.0
		Guanta, 1986	8,900- 9,900	9	9	3,499	1,855,863	29.0
		Rumiyacu, 1982	10,100-10,600	...	1	...	184,939	28.7
	CLYDE PETROLEUM	Mariann, 1971	7,700	5	5	456	3,515,214	20.0
		Fanny, 1972	7,700	8	8	2,650	9,319,890	22.5
		Tarapoa, 1973	8,300	2	2	212	919,579	20.0
	CEPE-ORIENTE[e]	Shushuqui, 1980	9,200	6	6	36,719	177,633,235	28.8
		Shuara, 1980	9,100	8	8			29.6
		Secoya, 1980	9,100	15	15			30.3
		Charapa, 1967	10,000	12	12			30.0
		Cuyabeno, 1972	8,050	4	4			28.8
		Sansahuari, 1979	8,100	1	1			28.8
		Tetete, 1980	9,300	5	5			28.0
		Bermejo, 1967	5,000	9	9			34.0
	CEPE-PENINSULA[e]	Ancon, 1921	4,000	475	475			35.6
		Carpet	...	70	70			...
		Cautivo	...	100	100			...
		Total Ecuador		**942**	**996**	**174,700**	**1,296,236,537**	
EGYPT	GUPCO/AMOCO	● El Morgan, 1965	5,100- 6,400	89	112	119,412	1,010,500,000	27.0-32.0
		● July, 1973	8,100-10,000	37	44	78,928	451,000,000	31.0-34.6
		● Ramadan, 1974	11,300	23	25	42,507	362,100,000	31.7
		● October, 1978	11,000	23	27	123,102	298,800,000	28.0
		● Shoab Ali, 1978	5,500	15	47	13,865	126,200,000	30.0
		● SG-300, 1976	5,876	1	2	2,326	17,700,000	24.8
		● Sidki (382), 1977	10,500	5	7	7,542	38,200,000	33.9
		● GS (365) 1980	10,140	...	1	...	490,000	32.0
		● GS (277), 1980	8,610	1	1	877	2,200,000	34.0
		● SB (305), 1981	8,100	1	1	585	2,020,000	30.0
		● Badri (315), 1981	6,400	16	35	38,735	42,700,000	27.0
		● Younis (347), 1981	4,300	4	5	6,870	11,980,000	32.0
		● GH (376), 1981	8,600	2	5	3,184	5,800,000	25.0
		● SB (339), 1981	4,600	1	1	626	571,000	29.5
		● Nessim (336), 1981	6,700	2	2	865	8,700,000	26.9
		● Hilal (404), 1982	9,200-10,000	5	6	29,869	36,100,000	32.0
		● Waly (356), 1982	6,900	3	3	976	2,980,000	32.0
		● GS (345/346), 1982	7,500	1	2	131	1,130,000	38.0
		● SB (367), 1984	7,000	1	1	455	1,180,000	38.0
		● GS (381), 1985	8,700	...	1	...	920,000	37.0
		Abu Gharadig, 1972	9,500	18	25	11,951	50,390,000	36.0
		WD-33, 1972	9,800-10,800	1	1	56	2,110,000	32.0
		Razzak and E. Razzak, 1972	7,000	9	17	3,475	50,940,000	36.0
		● GS-327, 1983	5,600	1	1	3,202	1,500,000	20.0
		● SB-294, 1986	11,600	1	1	1,099	692,000	30.5
		NAG-9/9-1, 1985	10,000	2	2	1,318	986,000	35.0
		NEAG-9/15, 1984	10,635-12,128	1	1	194	203,000	35.0
		WD-33/15, 1985	5,800	2	2	1,863	683,000	30.0
	AGIP	● Belayim Marine, 1961	9,100	55	65	133,493	557,392,209	29.0
		Belayim Land + Minori, 1954	8,500	96	103	40,613	413,674,357	21.5
		Meleiha, 1972	5,950	21	23	11,263	5,157,963	41.6

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
	WEPCO/PHILLIPS PETROLEUM	El Alamein, 1966	8,700	17	19	1,822	66,182,919	33.6
		Umbarka, 1976	10,700	4	5	2,580	5,713.603	43.9
		Yidma, 1971	9,000	3	5	1,185	21,760,274	44.0
	OSOCO/TOTAL	• Shukheir Bay, 1978	6,300	1	1	467	1,916,875	34.5
		• S. Ramadan, 1982	10,000	2	2	886	723,666	36.5
	GEYSUM	• Geysum, 1980	5,500	5	5	...	...	17.0
	SUESSO (ESSO)	• East Zeit, 1982	11.000	6	6	15,730	9,065,353	38.0
	KHALDA	Salam, 1983	9,000	19	22	20,228	7,405,340	43.0
		Khalda, 1983	7,000	5	6			43.0
		Hayat, 1986	9,000	3	3			43.0
		Safir, 1966	12,000	1	1			43.0
		Tut, 1986	9,000	1	1			43.0
		Safir North, 1986	11,600	2	2			...
	BADR PETROLEUM/SHELL	Badr el din, 1982	10,800	9	9	11,040	15,730,000	38.0
	EGPC$^{(e)}$	Gharib, 1938	2,200- 4,500	81	215	162,680	691,653,441	24.3
		Bakr/W. Bakr, 1958/1978	3,200- 1,500	48	83			18.0-19.0
		Umel Yusr, 1968	3,000- 3,300	19	37			21.5
		Amer, 1965	3,500	21	39			[illegible]
		El Ayoun, 1968	3,300	5	12			22.0
		Kareem, 1958	2,300	[illegible]	35			16.6
		Kheir, 1973	1,050	[illegible]	4			28.5
		Shukheir, 1966	2,500	5	11			34.0
		Ras El Behar, 1983	4,500	6	11			32.5
		Esh Elmalaha	3,700	2	2			44.0
		Sudr, 1946	2,600	12	20			21.6
		Asl, 1947	3,000	3	6			21.6
		Matarma, 1948	2,000	2	2			14.6
		El Khaligue, 1980	1,600	...	1			29.4
		Abu Senan T&Y, 1981	6,000	12	20			...
		Hurghada, 1913	...	NA	NA			...
	SUCO$^{(e)}$	• Ras Budran, 1978	11,400	16	16			25.0
		• LL 87-2, 1975	11,000	...	1			35.0
		• Ras Fanar, 1978	2,300	6	6			35.0
		• Zeit Bay, 1981	4,200	22	22			33.0
	EPEDECO$^{(e)}$	West Bakr, 1978	1,300- 1,500	20	25			18.0
	EGYPTCO$^{(e)}$	Meleha, 1972	6,000	12	12			40.0
	SHUKAIR MARINE CO.$^{(e)}$	O. Suco	...	1	1			...
	EL ALAMEIN$^{(e)}$	Mors	...	1	1			...
		Total Egypt		**821**	**1,244**	**896,000**	**4,325,151,000**	
FRANCE	**ALSACE**	All fields	...	18	11	347	2,929,089	...
		Abandoned	...	...	...	...	24,337,343	...
	AQUITAINE BASIN	Lacq Superieur, 1949	2.170	42	27	904	25,563,610	22.3
		Parentis, 1954	7,710	58	45	5,553	196,115,891	33.4
		Lugos, 1956	5,250	21	5	732	9,933,193	20.8
		Cazaux, 1959	7,550	36	35	4,381	67,779,650	34.2-37.0
		Lavergne, 1962	11,480	4	2	389	12,146,393	41.7
		Pecorade, 1974	10,660	10	10	2,470	9,041,862	29.3
		Castéra-Lou, 1976	9,600	8	3	427	2,330,489	21.7
		Vic Bilh, 1979	7,100	30	15	5,775	14,742,496	26.6
		Lagrave, 1984	6,500	3	...	4,152	4,061,327	42.5
		Other	...	7	5	244	10,231,603	...
		Abandoned	...	...	...	...	8,848,691	...
	PARIS BASIN	Coulommes, 1958	6,230	31	18	391	13,213,378	32.6
		Châteaurenard, 1958	1,800	25	22	354	4,734,307	27.5
		St. Martin, 1959	4,590	12	4	320	8,351,063	33.0
		Villeperdue, 1959	6,100	93	27	14,594	11,434,528	34.4
		St. Firmin, 1960	1,800	34	28	513	9,799,700	27.5
		Chuelles, 1961	1,800	35	33	453	6,857,012	27.5
		Soudron, 1976	4,600	20	10	446	1,925,558	34.4
		Donnemarie, 1979	8,040	2	5	800	1,828,126	36.2
		Chaunoy, 1983	7,350	43	20	15,767	16,141,341	37.1
		St. Germain, 1984	7,200	7	5	1,103	1,433,088	36.0
		Vert-le-Grand, 1986	6,230	4	...	1,288	494,891	34.8
		Other	...	82	86	3,781	12,605,903	...
		Abandoned	...	...	...	...	13,476,998	...
	SOUTHEAST + JURA	Abandoned	...	...	...	...	223,063	...
		Total France		**625**	**416**	**65,184**	**480,580,583**	
GABON	**ELF**$^{(e)}$	• Anguille, 1962	9,200					31.2
		• Anguille NE, 1968	7,500					32.0
		• Anguille NNE, 1971	7,500					32.0
		• Barbier, 1972	6,000					29.5
		• Breme, 1976	5,000					36.5

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Clairette, 1956	4,400					29.0
		• Girelle, 1973	9,400					32.0
		• Gonelle, 1972	5,800					24.2
		• Grondin, 1971	7,500					16.4
		• Mandaros, 1972	4,900					19.8
		Olende, 1976	6,700					33.8
		• P.G.S. Marine, 1975	7,500	214	330	113,323	906,840,000	32.5
		• Port Gentil Ocean, 1964	6,500					33.0
		Tchengue, 1957	4,100					26.8
		• Torpille, 1968	8,200					35.8
		• Baliste, 1974	4,900					28.3
		• M'Bya Sud, 1969	6,700					35.4
		• Anguille SE, 1962	8,200					32.8
		• Ayol Marine, 1979	7,700					22.8
		• Baudroie N., 1980	7,500					34.5
		• Baudroie Marine, 1968	7,500					33.3
		Other	...					...
	SHELL GABON	Gamba/Ivinga, 1963	3,000- 3,100	50	84	12,800	254,472,000	31.6
		Lucina-Marine, 1971	5,900	14	22	9,620	48,311,000	38.4
		Lucina-Marine W., 1982	NA	...	...	1,220	1,645,000	37.0
	AMOCO	Oguendjo B and C, 1981	5,000- 6,000	15	15	12,907	27,656,000	36.0
	TENNECO	• Pelican, 1985	9,300	3	3	4,980	1,818,000	31.0
		• Octopus, 1984	10,300	3	3	1,150	420,000	33.0
		• Obando, 1984	8,650	...	1	...	...	32.0
		Total Gabon		**299**	**458**	**156,000**	**1,241,162,000**	
GHANA(e)	AGRI-PETCO	• Saltpond, 1977	8,500	...	3	...	3,938,000	36.0-39.0
		Total Ghana		...	**3**	...	**3,938,000**	
GREECE(e)	N. AEGEAN PET. CORP.	• Prinos, 1974	8,000- 8,800	16	16	22,500	52,325,000	30.6
		Total Greece		**16**	**16**	**22,500**	**52,325,000**	
GUATEMALA		Rubelsanto, 1974	5,300- 7,000	7	7	1,061	5,345,739	26.0-30.0
		West Chinaja, 1977	3,200- 3,800	3	3	924	6,795,954	35.0-43.0
		Caribe, 1981	6,830- 7,280	3	3	1,600	3,185,709	22.0-24.0
		Tortugas	2,300	...	...	...	67,804	35.0
		Tierra Blanca	11,230	...	...	...	175,113	19.5
		San Diego, 1981	17,150	1	1	105	120,953	34.7
		Xan, 1985	...	1	1	...	60,082	17.5
		Total Guatemala		**15**	**15**	**3,690**	**15,752,354**	
INDIA	GUJARAT STATE	Ankleshwar, 1960	1,969- 6,564	114	198	23,917	409,840,000	44.0-51.0
		Kalol, 1961	4,595-10,830	114	204	6,254	36,663,000	38.0
		Sanand, 1962	4,267-10,174	21	40	2,408	8,047,000	26.0
		Nawagam, 1963	4,595-10,174	71	110	2,690	23,440,000	31.0
		Kadi, N., 1968	3,610- 7,220	152	201	13,882	42,780,000	21.0
		Kadi, S., 1968	6,892- 9,846	3	16	448	1,210,000	24.0
		Sobhasan, 1968	4,595- 9,846	59	88	6,290	17,236,000	26.0-40.0
		Viraj, 1978	4,595- 4,923	7	24	1,468	2,776,000	20.0
		Gandhar, 1984	9,486-12,145	9	21	2,950	1,106,000	47.0
	ASSAM STATE	Rudrasagar, 1960	7,877-13,128	44	71	9,124	28,457,000	25.0
		Lakwa-Lakhmani, 1964	6,564-14,113	176	260	34,292	120,488,000	33.0
		Geleki, 1968	9-518-14,769	74	127	7,628	22,536,000	30.0
	NAGALAND	Changpang, 1973	8,861-10,502	7	12	1,721	2,690,000	34.0
	TAMIL NADU	Narimanam, 1985	6,236- 7.549	2	3	152	87,000	29.0-45.0
	WEST COAST	Bombay High, 1974	3,282- 7,877	205	323	362,462	885,306,000	39.0
		Panna (North Bassein), 1976	4,923- 7,549	5	11	998	325,000	38.0
	OTHER FIELDS(a)	Wavel, 1962	4,595- 7,220					
		Kosamba, 1963	1,313- 8,533					
		Kholka, 1966	4,365- 5,577					
		Bakrol, 1966	2,626- 9,846	1,573	1,652	104,054	365,560,000	...
		Kathana, 1965	5,250- 5,906					
		Digboi, 1980	300- 7,500					
		Moran, 1958	11,000					
		Nakhonkatiya, 1953	9,400					
		Total India		**2,670**	**3,413**	**580,000**	**2,002,164,000**	
INDONESIA	PERTAMINA	Besitang, 1977	3,973					51.5
	UEP I(a)	Gebang, 1977	2,917					54.0
		K. Simpang, 1971	3,740- 5,019					45.0
		P. Tabuhan, 1937	3,350- 5,893	204	226			50.8

	Name of field, discovery date	Depth, ft	No. of wells — Producing	No. of wells — Total	Production — 1987 average b/d	Production — Cumulative to Dec. 31, 1987 bbl	°API gravity
	Rantau, 1929	2,764					45.3
	Serang Jaya, 1926	3,701					47.5
PERTAMINA UEP II(a)	Benuang, 1942	6,103					35.1
	Benakat East, 1973	NA					NA
	Tempino, 1931	1,647					23.0
	Gn. Kemala, 1938	5,448					38.0
	Limau, 1928	3,896- 4,626					NA
	Ogan Timur, 1943	3,793					27.42
	Talang Jimar, 1937	4,123	412	1,419			31.0
	T. Miring, 1935	640					NA
	Tanjung Tiga, 1938	3,750					28.0
	Kenali Asam, 1931	2,077					29.0
	Belimbing	5,371					...
	Kuang, 1940	5,249					25.1
PERTAMINA UEP III(a)	Cemara, 1976	3,964- 7,104					...
	Jatibarang, 1969	3,063	88	184			29.0
	Tugu Barat, 1979	3,014					...
PERTAMINA UEP IV(a)	Bunyu, 1923	2,077					33.2
	Sangatta, 1939	1,842					33.0
	Tanjung, 1938	2,296	161	334	69,668	2,928,974,192	39.9
	Tapian Timur, 1967	4,396					38.8
	Warukin S., 1966	2,067					26.9
PERTAMINA UEP V(a)	Klamono, 1936	574					19.0
	Linda, 1977	3,281	47	55			19.0
	Sele, 1951	2,156					35.0
PERTAMINA (FROM STANVAC)(a)	Sago, 1940	1,800					34.0
	Lirik, 1939	1,600					34.0
	Molek, 1956	2,600					34.0
	N. Pulai, 1941	1,800					34.0
	S. Pulai, 1941	1,800	354	354			34.0
	Talang Akar, 1922	2,800					35.0
	Benakat, 1932	1,600					35.0
	Jirah, 1930	2,300					35.0
	Rajah, 1940	6,000					38.0
	Abab, 1951	6,000					36.0
PERTAMINA (N.E. KALIMANTAN)(a)	Sembakung, 1976	2,600	17	19			36.0
	Bangkudulis, 1980	3,250	...	1			39.5
PERTAMINA (FROM PHILLIPS)(a)	Salawati, 1976	5,749	7	13			39.2
LEMIGAS(a)	All fields, 1893-1909	2,155- 2,297	71	419			...
ARCO(a)	Ardjuna, 1969	2,380- 7,250	266	330			37.0
	Arimbi, 1972	2,943	10	12			33.0
CSR	Bula, 1897	280- 1,300	61	70	1,299	14,632,000	23.0
CAL ASIATIC	Batang, 1975	690	12	20	310	916,000	19.2
	Buaya, 1978	2,035	...	2	...	96,000	28.0
	Lindai, 1971	1,100	16	18	550	3,022,000	30.7
	Menggala S., 1968	3,765	1	1	480	7,669,000	33.5
	Tanjung Medan, 1976	2,770	2	7	380	890,000	37.6
	Benua, 1978	2,400	19	22	4,930	7,357,000	41.4
	Beruk, 1974	1,750	17	23	5,310	22,080,000	38.0
	Bungsu, 1976	2,050	7	8	750	5,303,000	36.4
	Damar, 1974	4,650	5	6	270	2,225,000	33.5
	Dusun, 1979	2,550	6	7	1,310	2,332,000	42.3
	Gatam, 1977	2,385	3	3	...	314,000	33.5
	Kasikan, 1972	660	18	24	470	2,894,000	27.3
	Beruk NE, 1976	1,800	3	5	90	796,000	40.0
	Osam, 1978	900	4	5	150	384,000	31.8
	Paitan, 1978	2,315	1	1	110	305,000	31.6
	Pedada, 1973	950	30	31	5,680	32,503,000	33.1
	Pusaka, 1977	2,250	19	23	2,990	5,101,000	34.6
	Sabak, 1974	2,350	14	15	880	8,805,000	35.8
	Terantam, 1973	900	4	4	80	335,000	31.7
	Zamrud, 1975	3,600	53	54	11,460	28,945,000	40.3
	Langgak, 1976	1,380	17	22	640	2,056,000	31.7
ASAMERA (NORTH SUMATRA)	Geudondong, 1965	3,192	...	...	...	...	53.1
	Juku Rayeu, 1968	2,832	9	65	221	12,284,056	53.6
	Iee Tabeu, 1971	2,721	3	73	47	11,891,664	50.3
	Alur Cimon, 1972	3,098	...	34	...	...	50.8
	Tualang, 1973	2,631	13	75	2,602	29,601,774	49.9
	Peudawa, 1980	3,083	...	30	...	...	48.1
ASAMERA (SOUTH SUMATRA)	Kluang, 1913	2,591	30	88	595	33,674,788	42.6
	Mangunjaya, 1934	2,700	8	110	138	22,980,078	32.0
	Tanjung Laban, 1982	3,590	16	24	5,609	4,567,078	38.1
	Ramba, 1982	3,150	60	65	28,360	35,936,986	37.0
	Rawa, 1985	4,038	...	18	1	57,289	38.7
	Tempino, 1931	4,493	3	17	153	1,259,127	40.9
	Bentayan, 1932	4,446	6	13	825	672,555	22.0
	Panerokan, 1976	4,915	3	8	36	178,846	39.4

			No. of wells		Production		
	Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
MAXUS ENERGY	● Cinta, 1970	3,500	36	46	13,158	171,187,861	34.0
	● Gita, 1972	5,000	6	9	1,036	6,452,248	34.5
	● Kitty, 1973	2,700	6	7	1,161	13,615,268	18.0
	● Nora, 1973	3,200	3	5	391	8,667,165	29.0
	● Rama, 1974	3,200	44	75	7,381	88,607,804	31.0
	● Selatan, 1971	4,000	8	19	1,277	20,402,184	19.5
	● Zelda, 1971	7,500	27	43	6,303	34,764,756	33.0
	● Krisna, 1979	4,500	28	41	7,413	57,130,762	37.0
	● Yvonne, 1980	4,500	9	11	4,016	11,317,588	36.0
	● Farida 1982	8,000	10	22	3,118	10,581,595	32.0
	● Titi, 1982	8,000	...	4	...	1,654,547	33.0
	● Sundari, 1982	4,400	12	15	3,371	9,700,365	25.0
	● Duma, 1983	2,300	3	6	158	657,997	16.0
	● Karmila, 1983	4,800	7	9	10,585	25,813,993	36.0
	Wanda, 1984	4,800	2	5	110	1,549,429	36.0
PETROMER TREND	Canderawasih, 1976	3,500	11	17	1,268	11,697,058	27.8
	Jaya, 1973	3,050	14	19	1,785	35,366,509	42.0
	Kasim, 1972	3,350	36	49	4,790	45,774,419	38.0
	Walio, 1975	2,750	224	268	17,803	146,754,005	34.2
	Other	...	11	22	1,883	11,882,221	...
CALTEX	Aman, 1974	4,700	10	10	2,343	6,021,389,337	38.6
	Antara, 1978	1,425	5	5	700		35.9
	Balam SE, 1972	4,500	13	13	671		29.0
	Balam South, 1969	1,600	48	48	8,446		33.4
	Bangko, 1970	1,950	75	85	26,341		33.7
	Batang CPI, 1975	690	6	7	286		19.0
	Bekasap, 1955	2,950	53	60	20,392		33.7
	Bekasap S., 1968	3,900	8	11	736		34.1
	Benar, 1973	2,450	25	26	4,429		33.2
	Cebakan, 1974	4,700	4	4	619		30.2
	Duri, 1941	770	1,073	1,370	80,105		21.9
	Garuk, 1980	4,600	1	2	4		30.6
	Hitam, 1975	6,690	4	5	1,343		38.8
	Intan, 1977	3,350	6	6	864		32.9
	Jorang, 1972	5,500	16	18	9,123		38.0
	Kerang, 1977	3,900	11	13	1,044		38.7
	Kopar, 1974	5,300	13	18	2,582		37.2
	Kotabatak, 1952	5,500	67	113	18,384		28.8
	Kulin, 1970	2,050	55	61	4,843		19.8
	Libo SE, 1973	5,900	24	27	10,328		41.6
	Libo, 1968	6,000	9	10	1,711		34.6
	Lincak, 1981	2,570	4	4	728		35.2
	Menggala N., 1968	3,850	14	17	4,136		32.5
	Menggala S. CPI, 1968	3,765	7	8	1,852		33.6
	Minas, 1944	2,600	465	604	254,990		34.7
	Mindal, 1971	3,400	2	3	74		36.5
	Mutiara, 1976	3,500	2	2	36		34.1
	Nella, 1977	5,000	3	3	47		34.5
	Obor, 1978	7,370	1	1	149		39.9
	Pager, 1974	4,300	23	25	6,544		37.5
	Pelita, 1977	6,600	5	5	621		39.0
	Pematang, 1959	3,750	37	43	8,683		31.9
	Pematang Bow, 1969	5,300	5	9	851		33.0
	Pemburu, 1981	2,300	8	9	3,709		35.3
	Perkebunan, 1977	2,300	...	1	...		29.4
	Petani, 1964	4,750	33	34	14,478		32.8
	Petapahan, 1971	4,500	23	28	5,736		28.1
	Pinang, 1971	3,950	19	20	2,355		29.8
	Pinggir, 1972	3,300	5	6	373		34.5
	Pinggir S., 1973	3,300	2	2	56		38.6
	Pudu, 1972	5,950	8	12	1,614		35.3
	Puncak, 1979	2,400	14	14	3,769		35.9
	Pungut, 1951	3,400	27	27	4,850		37.9
	Rangau, 1968	6,100	3	10	104		42.0
	Rantaubais, 1972	1,070	14	16	543		18.3
	Rokiri, 1979	6,100	...	2	...		41.3
	Seruni, 1972	3,000	22	23	4,821		35.3
	Sikladi, 1975	4,340	18	18	2,593		39.8
	Singa, 1977	3,200	1	1	55		31.0
	Sintong, 1971	3,400	19	20	2,005		32.3
	Sintong SE, 1973	4,500	...	1	...		36.1
	Suram, 1971	1,750	4	6	252		27.7
	Tandun, 1969	3,000	9	9	740		33.2
	Telinga, 1975	4,205	7	8	925		33.3
	Topaz, 1977	5,200	7	7	1,992		33.2
	Topi, 1979	3,630	1	1	63		36.7
	Tunas, 1983	4,819	2	2	370		35.0
	Ubi, 1976	4,350	20	21	1,584		35.1
	Waduk, 1982	6,100	10	11	324		37.6
STANVAC (CENTRAL SUMATRA)	Binio, 1972	1,600	20	21	454	11,677,943	34.0
	Pekan, 1976	3,700	22	22	795	7,573,274	35.0

	Name of field, discovery date	Depth, ft	No. of wells		Production		°API gravity
			Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	
	Merbau, 1979	2,700	26	26	1,299	6,334,383	36.0
	Kerumutan, 1980	3,000	22	23	1.163	4,711,496	35.0
	N. Merbau, 1980	2,600	8	9	272	2,750,090	36.0
	Panduk, 1981	2,500	6	6	228	1,401,271	46.0
	Kayuara, 1982	3,700	9	10	559	1,878,810	35.0
	Gemuruh, 1983	2,800	17	17	1,505	1,928,259	34.0
	E. Kayuara, 1983	3,500	45	49	5,698	5,238,225	35.0
	Mutiara, 1985	2,700	2	2	79	97,163	34.0
	Other	4,600	...	...	...	9,175	...
STANVAC (SOUTH SUMATRA)	Ibul, 1970	5,700	12	14	760	21,667,050	36.0
	Rambutan, 1972	4,500	5	7	29	3,210,751	42.0
	● Tabuan (PSC)	4,000	10	10	1,220	1,178,193	34.0
	Jene, 1985	6,500	8	10	9,564	4,085,391	35.0
	Pian, 1986	6,000	1	1	217	26,512	36.0
	● Kerang (PSC), 1984	2,900	2	3	744	271,616	35.0
	Lagan, 1986	2,400	4	4	290	111,815	56.8
	Other	4,500	3	3	196	868,406	...
ROY M. HUFFINGTON INC.	Badak, 1972	5,190-10,600	36	107	5,362	37,953,108	32.0
	Nilam, 1974	7,500-11,500	36	95	5,640	18,470,239	32.0
	Pamaguan, 1974	900- 5,100	14	27	1,962	5,898,117	30.0
	Mutiara, 1984	900- 5,800	12	19	2,599	2,961,789	30.0
	Semberah, 1974	2,900-10,100	...	16	...	7,054	35.0
TOTAL CFP	● Tambora, 1980	8,000-13,000	15	34	4,109	5,667,498	33.0
	● Handil, 1974	2,900- 9,000	219	272	115,033	617,340,703	33.0
	● Bekapai, 1972	4,600- 5,600	42	45	15,845	152,065,282	40.0
UNOCAL	● Attaka, 1970	7,500	75	88	47,116	433,197,460	39.0
	● Melahin, 1972	7,500	3	6	888	6,217,272	23.1
	● Kerindingan, 1972	7,000	...	8	20	5,038,615	23.8
	● Sepinggan, 1973	11,150	16	18	5,855	41,580,242	34.0
	● Yakin, 1976	5,100	21	28	8,917	18,290,674	18.8
	● Rajah, 1981	5,500	3	3	1,672	3,596,380	33.8
CONOCO GROUP	● Udang, 1974	5,595	22	28	8,646	53,319,790	40.0
	● Kepiting, 1982	6,000	2	2	2,570	1,094,050	37.0
MOBIL OIL	Arun, 1971	10,050	40	57	110,819	293,625,359	55.0
TESORO INDONESIA PETROLEUM	Samboja, 1909	360- 4,380	23	126	487	64,387,468	21.0
	Sanga Sanga, 1897	275- 6,000	107	240	2,941	266,631,554	32.0
	Tarakan, 1906	200- 6,540	530	1,165	1,730	210,151,159	20.0
MARATHON	● Kakap KH, 1980	7,000	11	12	16,150	9,343,000	45.0
HUDBAY (MALACCA STRAIT)	● Lalang, 1980	3,100- 3,600	13	16	10,870	30,550,000	39.6
	● Mengkapan, 1981	3,850- 4,450	10	10	22,300	8,440,000	42.0
	● Melibur, 1984	900- 1,300	12	13	8,680	3,210,000	35.6
	● Kurau, 1986	4,500- 5,000	7	7	...	...	47.4
TARAKAN PETROLEUM	Tarakan (Mamburungan field), 1984	5,227- 5,291	2	4	...	...	31.1
	Total Indonesia		**6,085**	**10,877**	**1,186,000**	**12,330,082,000**	

IRAN(e)

	Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
NIOC	Agha Jari, 1936	7,440	58	89	2,309,000	35,852,300,000	34.0
	Ahwaz Asmari, 1958	8,150	73	85			32.0
	Ahwaz Bangestan, 1958	12,000	...	7			24.3
	Bibi Hakimeh, 1961	4,570	19	33			29.9
	Binak, 1959	10,440	...	4			29.9
	Chillingar, 1974	3,350	...	1			39.3
	Chesmeh Khush, 1967	10,700	...	4			27.7
	Dehluran, 1972	11,900	...	6			31.0
	Gachsaran, 1937	3,400	46	62			31.0
	Haft Kel, 1927	1,980	2	11			37.7
	Karanj, 1963	5,360	7	7			33.9
	Kharg, 1961	10,900	...	...			31.6
	Kupal, 1965	10,500	...	7			32.8
	Lab-e Safid, 1968	4,350	...	7			35.3
	Mansuri, 1963	7,100	4	8			28.4
	Marun, 1963	9,400	55	112			32.6
	Masjid-e Suleiman, 1908	1,600	7	24			39.3
	Naft Safid, 1938	5,000	5	19			36.8
	Paris, 1964	4,670	22	27			38.8
	Par-e Siah, 1964	4,250	...	1			37.7
	Pazanan, 1961	7,250	44	71			37.2
	Rag-e Safid, 1964	7,230	19	29			28.6
	Ramin, 1966	12,200	...	...			32.9
	Ramshir, 1962	8,750	...	3			27.6
	Sulabedar, 1971	3,400	...	1			30.4
	Naft-e Shah, 1923	2,000- 3,000	...	...			43.0
	● Bahregansar, 1960	9,000	...	...			30.0
	● Hendijan, 1968	11,000	...	...			23.0
	● Nowruz, 1966	8,200	...	...			21.0
	● Rakhsh, 1969	7,650	...	...			35.8
	● Rostam, 1966	7,000	...	...			34.4
	● Ardeshir, 1969	2,800	...	...			27.0

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
		● Cyrus, 1962	7,000	...	...			18.3
		● Darius, 1961	11,000	...	...			34.0
		● Fereidoon, 1966	7,000	...	...			28.5
		● Sassan, 1965	7,500- 8,100	...	...			34.0
		Total Iran		**361**	**818**	**2,300,000**	**35,852,300,000**	
IRAQ		Ain Zalah, 1939	5,200- 6,500	10	28	2,360,000	19,630,000,000	31.0
		Bai Hassan, 1953	4,800- 5,400	62	77			34.0
		Butmah, 1953	3,900	6	17			31.0
		Hamrin, 1973	2,000	...	14			...
		Jambur, 1954	5,500-12,500	32	50			38.0
		Kirkuk, 1927	2,800- 4,200	65	238			36.0
		Naft Khaneh, 1909	3,500	6	11			42.5
		Rumaila North, 1958	7,300-10,300	291	433			33.0
		Rumaila South, 1953	7,300-10,200	126	201			34.0
		Zubair, 1949	7,400-10,200	53	108			35.0
		Abu Ghurab, 1971	9,800	15	16			24.0
		Buzurgan, 1970	12,000	19	22			24.0
		Jabel Fauqui, 1974	10,000	20	23			25.5
		Luhais, 1961	8,200	16	20			33.0
		Qaiyarah, 1929	650	42	50			16.0
		East Baghad, 1975	6,000- 7,000	72	79			17.0-23.0
		Suffayah, 1978	3,900	28	39			25.0
		Nahr Umar, 1949	8,200	5	13			42.0
		Total Iraq		**868**	**1,439**	**2,360,000**	**19,630,000,000**	
ISRAEL	LAPIDOTH.	Heletz-Brur, 1955	5,200	3	18	71	12,275,749	29.2
		Kochav, 1962	5,500	5	13	179	4,176,980	27.9
	OEL	Ashdod, 1976	8,400	2	2	37	142,300	32.5
	EMOG	Gurim, 1984	3,280	...	...	...	6,950	17.0
		Total Israel		**10**	**34**	**287**	**16,601,979**	
ITALY	AGIP	Cavone, 1979	10,663-18,068	13	15	2,248	6,595,652	24.0
		Malossa/S. Bartolomeo, 1973	17,881-21,231	3	11	1,272	25,405,322	55.0
		Pisticci-S. Cataldo, 1960	6,820- 6,880	7	11	1,376	7,444,887	11.4
		Gela, 1956	11,280-11,350	45	68	8,704	99,768,192	10.0
		Perla, 1982	7,850	4	4	732	1,558,244	13.3
		Cela Mare, 1959	10,300	6	17	1,386	14,019,078	10.0
		Ragusa, 1954	5,760	41	41	4,790	126,201,977	19.5
		Nilde, 1977	4,545	2	3	11,802	18,935,805	38.9
		S. Maria, 1980	7,590	3	3	181	258,168	15.9
		Emilio S., 1985	9,215	1	1	...	337,622	13.0
		Narciso, 1985	2,650	1	1	...	989,278	21.1
		Other	...	25	63	4,001	19,949,277	2.8-55.9
	ELF	● Santa Maria a Mare, 1974	7,900	9	10	1,695	17,240,000	23.0
		● Rospo Mare, 1975	4,600	9	9	17,880	10,644,00	11.0
		● Sarago Mare, 1979	5,200	5	5	4,830	7,917,000	8.0
		Total Italy		**174**	**262**	**60,897**	**357,264,502**	
IVORY COAST	ESSO COTE D'IVOIRE	● Belier, 1975	6,500	11	18	4,184	16,750,000	35.0
	PHILLIPS-AGIP-SEDCO-PETROCI	● Espoir, 1980	6,500-11,000	6	8	11,990	28,085,648	32.3
		Total Ivory Coast		**17**	**26**	**16,174**	**44,835,648**	
JAPAN(e)	JAPEX	● Aga-Oki, 1972	7,590	7	7	12,200	139,623,000	24.8
		Higashi-Niigata, 1965	4,500- 9,200	18	28			53.9
		Sarukawa, 1958	2,000- 3,200	62	134			32.3
		Yoshii, 1968	8,000	9	25			61.8
		Yurihara, 1976	1,310- 7,610	9	14			43.5
		Katakai, 1960	3,310-16,300	5	16			50.0
		Other	...	56	77			...
	IDEMITSU OIL DEVELOPMENT CO. LTD.	● Agaoki-Kita, 1982	4,950	10	10			33.0
	TEIKOKU OIL	Yabase, 1933	1,100- 5,800	61	73			33.0
		Minami-Aga, 1964	7,300- 9,600	10	26			38.5
		Minami-Nagaoka, 1984	13,200-15,100	5	11			55.7
		Hagashi-Kashiwazaki, 1970	6,000- 8,900	6	13			62.0
		Kubiki, 1959	1,100- 6,400	94	125			29.7
		Other	...	35	47			...
		Total Japan		**387**	**606**	**12,200**	**139,623,000**	
JORDAN	NRA	Hamzah, 1984	9,515	3	3	500	295,437	30.0
		Total Jordan		**3**	**3**	**500**	**295,437**	

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
KUWAIT(e)	KOC	Burgan, 1938	4,800	210	393	1,122,000	22,649,998,000	30.8
		Ahmadi, 1952	4,800	11	84			31.7
		Magwa, 1951	4,800	71	113			33.0
		Raudhatain, 1955	8,600	41	53			34.4
		Bahra, 1956	8,500	...	2			...
		Sabriya, 1957	8,300	9	44			36.3
		Minagish, 1959	10,000	1	21			34.4
		Umm Gudair, 1962	9,000	20	33			26.9
		Total Kuwait		**363**	**743**	**1,122,000**	**22,649,998,000**	
LIBYA	AGIP	Bu Attifel, 1968	14,300	28	37	136,758	770,690,617	40.8
		Rimal Katib, 1965	14,000	3	7	6,412	5,252,690	35.0
	ELF	El Meheiriga	10,500	1	2	829	22,599,371	46.0
	LNOC(e)	Arshad, 1966	10,100	491	491	946,001	15,329,782,322	42.0
		Jebel, 1962	8,100					38.0
		Majid, 1968	9,000- 9,800					...
		Don Mansour Unit	5,600					...
		Nasser, 1959	5,500- 7,600					38.0
		Lehib-Dor Marada Unit, 1965	9,500					50.0
		Raguba, 1961	5,400					43.0
		Beda, 1959	4,000					36.0
		Bualawn, 1972	6,000					40.0
		Dor, 1967	6,400					33.2
		Kotla, 1963	5,500					34.0
		Sahabi B & D, 1961	9,000-10,000					39.0
		Sarir, 1961	9,000					37.2
		Amal, 1959	9,900					37.5
		Ora, 1962	7,250					40.2
		Ghani, 1978	6,000					40.0
		Bahi, 1968	3,500- 3,750					43.4
		Belhedan, 1962	7,000					33.6
		Dahra, 1959	3,100- 3,700					37.0-41.0
		Defa, 1969	5,400- 5,900					35.6
		Gialo, 1961	2,200- 6,300					35.7
		Harsh, 1978	7,400					34.6
		Khalifa, 1978	5,400- 7,000					34.6
		Masrab, 1978	10,000					39.6
		Samah, 1961	9,000					33.4
		Waha, 1960	6,000					36.0
		Zaggut, 1962	6,000					36.4
		Balat, 1983	5,100- 5,400					32.2
		Ali, 1975	3,900	1	2			50.0
		Almas, 1975	4,000	5	8			49.5
		Intisar A, 1967	9,750	8	19			45.0
		Intisar B, 1974	9,600	2	2			50.0
		Intisar C, 1967	9,650	1	6			37.5
		Intisar D, 1967	9,400	19	27			39.0
		Intisar E, 1968	5,300- 7,100	8	11			34.7
		Nafoora-Augila, 1966	2,200-10,000	13	55			35.5
		Aswad, 1978	6,250	8	8			46.0
		Sabah, 1977	5,500	36	38			42.0
		Zella, 1977	6,750	27	31			48.1
		Other	7,900- 8,900	1	2			40.4
		Fidae, 1979	7,000	9	9			41.7
		Hakim, 1978	6,700	3	3			48.5
		Total Libya		**664**	**758**	**1,090,000**	**16,128,325,000**	
MALAYSIA	ESSO MALAYSIA	● Bekok, 1976	5,500	23	30	268,000	759,820,000	47.0
		● Pulai, 1973	4,300	23	32			42.3
		● Tapis, 1975	6,700	70	106			45.0
		● Kepong, 1979	6,000	3	10			47.0
		● Tiong, 1978	5,800	28	42			47.0
		● Tinggi, 1980	4,400	26	31			48.0
		● Irong Barat, 1979	3,300	10	12			35.0
		● Semangkok, 1980	3,700	5	5			42.5
		● Guntong, 1978	...	9	14			...
		● Palas, 1979	...	11	11			...
		● Tabu, 1978	...	9	13			...
	PETRONAS CARIGALI(e)	● Tembungo, 1971	6,000	8	16	10,620	31,276,000	40.0
		● Fairley Baram, 1973	8,655	...	2	...	5,845,000	39.5
	SARAWAK SHELL	● D18, 1981	4,000	5	5	4,160	1,618,000	35.0
		● West Lutong, 1966	5,600	12	27	10,110	121,690,000	39.5
		● Baram, 1963	9,500	12	36	7,640	135,989,000	40.5
		● Bakau, 1971	11,000	3	3	130	7,047,000	39.0
		● Temana, 1972	3,100	18	31	9,070	36,211,000	35.0
		● Bayan, 1976	4,200	6	7	13,750	21,710,000	35.0
	SARAWAK SHELL/PETRONAS CAR.	● Baronia, 1967	7,900	19	40	15,260	148,770,000	42.0
		● Betty, 1967	7,900	13	17	14,320	62,327,000	38.0

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average b/d	Production: Cumulative to Dec. 31, 1987 bbl	°API gravity
		● Tukau, 1966	5,000	26	48	22,600	91,749,000	29.2
		● Bokor, 1972	2,000	18	19	24,140	34,011,000	35.0
		● Siwa, 1973	4,100	4	4	1,360	1,496,000	25.0
	SABAH SHELL	● Barton, 1971	2,400	4	4	3,920	9,331,000	37.0
		● South Furious, 1974	3,300	7	15	3,010	13,499,000	30.0
		● St. Joseph, 1975	2,200	11	14	16,360	20,271,000	32.0
		● Erb West, 1977	6,785	15	19	6,630	21,620,000	30.0
		● Samarang, 1972	5,700	49	70	53,370	235,380,000	37.0
		● Ketam, 1977	4,800	1	6	550	901,000	33.0
		Total Malaysia		**448**	**[illegible]**	**485,000**	**1,780,571,000**	
MEXICO(e)	**NORTH-ZONE, NE**	Misión, 1945	5,440	3	3			...
		Monterrey, 1950	6,510	5	6			...
		Tigrillo, 1971	3,342	...	11			...
	NORTH ZONE, N.	● Arenque, 1970	1[illegible],362	17	17			26.0
		Constituciones, 1956	6,350	176	176			17.0
		Ebano-Pánuco, 1901	[illegible],450	324	324			12.0
		Tamaulipas	4,200	152	152			19.0
	NORTH ZONE, S.	Chicontepec, 1973	4,264	220	220			34.1
		● Isla de Lobos, 1963	6,875	9	9			40.0
		● Marsopa, 1974	10,198	7	7			39.0
		Naranjos-C. Azul, 1909	1,800	206	206			22.0
		Tres Hermanos, 1959	6,960	34	34			21.0
		Other	...	...	...			...
	CENTRAL ZONE, POZA RICA	● Atún, 1966	9,040	7	7			37.0
		● Bagre, 1973	10,919	8	8			33.0
		Escolín, 1942	7,216	95	95			26.3
		Hallazgo, 1955	10,170	36	36			25.0
		Jiliapa, 1958	7,390	29	29			24.0
		Mecatepec, 1941	7,544	32	32			29.8
		Miquetla, 1959	6,400	57	57			35.0
		Poza Rica, 1930	7,090	132	132			35.0
		Pres. Alemán, 1949	8,036	86	86			26.0
		Remolino, 1962	10,745	36	36			29.5
		San Andrés, 1956	10,410	123	123			29.0
		Other	...	315	316			...
	CENTRAL ZONE, CUENCA DEL PAPALOAPAN	Matapionche, 1974	11,129	29	45			35.6
		Other	...	22	31			...
	SOUTHERN ZONE, NANCHITAL	Ixhuatlán Ote., 1965	1,960	20	34			22.6
		Moloacán, 1962	500	170	207			22.3
		Santa Rosa, 1952	1,312	6	9			25.4
	CENTRAL ZONE, N. FAJA DE ORO	Acuatempa, 1955	4,085	6	6			21.0
		Muro, 1965	3,966	11	19			17.0
		Ordóñez, 1952	5,220	8	8			21.0
		Ocotepec, 1953	3,737	13	13			20.0
		Santa Agusda, 1953	4.780	3	3			16.0
		Other	...	57	57			...
	SOUTHERN ZONE, EL PLAN	Agata, 1956	3,830	9	15			...
		Bacal, 1976	3,500	24	40			35.0
		Concepción, 1974	1,600	3	15			31.0
		Cuichapa, 1935	2,200	63	123			30.0
		El Plan, 1931	1,700	67	86			30.0
		Lacamango, 1973	1,700	18	27			26.3
		Los Soldados, 1953	4,492	18	22			32.0
		Other	...	26	38			[illegible]
	SOUTHERN ZONE, AGUA DULCE	Blasillo, 1967	7,216	31	58	2,541,000	14,676,444,000	[illegible]
		Cinco Presidentes, 1960	6,862	73	134			[illegible]
		Burro, 1931	2,200	23	38			26.0
		Venta, 1954	4,730	20	83			41.0
		Ogarrio, 1957	5,790	57	194			38.0
		Otates, 1965	7,469	12	18			39.0
		Rodador, 1971	11,398	14	14			26.0
		Sánchez Magallanes, 1957	4,240	73	345			27.0
		San Ramón, 1967	9,517	29	65			30.0
		Tonalá, 1928	1,770	21	61			28.0
		Other	...	3	15			...
	SOUTHERN ZONE, COMALCALCO	Agave, 1977	13,450	7	16			41.7
		Arroyo Zanapa, 1978	14,599	1	2			38.9
		Arteza, 1977	11,800	3	5			26.4
		Ayapa, 1972	8,200	3	5			7.2
		Cacho López, 1977	14,250	1	1			29.0
		Cáctus, 1972	14,100	14	30			31.5
		Carrizo, 1962	3,500	18	35			23.3
		Castarrical, 1967	10,080	38	59			29.3
		Comoapa, 1979	14,432	4	6			44.5
		Copano, 1977	11,890	9	10			43.9
		Cunduacán, 1974	13,775	12	42			28.9

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
		El Golpe, 1963	3,500	93	135			25.7
		Giraldas, 1977	15,225	21	22			37.0
		Iride, 1974	13,775	12	16			28.5
		Muspac, 1982	9,676	1	13			57.0
		Mecoacán, 1957	2,200	17	30			8.6
		Mora, 1981	...	61	63			38.1
		Mundo Nuevo, 1977	11,800	4	5			46.0
		Níspero, 1974	14,100	4	18			34.4
		Paredón, 1978	15,690	12	13			39.8
		Oxiacaque	11,150	5	21			29.1
		Platanal, 1978	15,900	...	...			30.2
		Río Nuevo, 1975	14,950	5	5			34.8
		Samaria (Cret), 1973	14,209	26	49			31.0
		Santuario, 1966	9,617	28	37			37.0
		Sitio Grande, 1972	13,766	19	22			35.0
		Sunuapa, 1978	12,887	2	7			32.8
		Tapijualpa, 1982	15,613	1	12			39.8
		Tintal, 1968	5,904	4	6			22.0
		Topén, 1978	11,172	2	3			25.4
		Tupilco, 1959	9,685	67	101			27.0
		Bellota, 1982	17,056	9	12			41.0
		Cardenas, 1979	17,548	26	45			38.0
		Chiapas, 1979	12,136	5	7			42.0
		Fenix, 1979	17,876	4	7			40.0
		Iris, 1979	14,432	8	8			39.2
		Jujo, 1980	17,548	18	19			32.0
		Caparroso, 1982	18,368	1	1			41.2
		Tecominoacan, 1983	19,519	1	5			37.5
		Jolote, 1983	18,119	1	1			39.4
		Artesa Terc., 1984	...	2	3			28.0
		Carmito, 1980	10,050	1	1			45.6
		Edén, 1983	17,590	1	2			38.5
		Samaria Terc., 1965	4,920	16	23			13.9
		Other	...	16	37			...
	GULF OF CAMPECHE	● Cantarell, 1976	8,528	63	75			21.3
		● Abkatun, 1978	11,800	25	35			30.0
		● Ku, 1979	10,000	8	15			22.0
		● Pol, 1979	12,600	8	8			35.0
		● Chuc, 1982	13,100	1	3			35.0
		● Ixtoc, 1984	...	1	2			35.0
		Total México		**3,768**	**5,120**	**2,541,000**	**14,876,444,000**	
MOROCCO		Essaouira	...	4	4	370	16,157,000	...
		Rharb, 1951	4,590	1	1	28		...
		Total Morocco		**5**	**5**	**398**	**16,157,000**	
NETHERLANDS	UNOCAL	● Helm, 1979	4,400	7	8	2,390	6,999,012	17.9
		● Helder, 1980	4,800	12	13	8,536	16,807,755	21.6
		● Hoorn, 1981	5,000	7	7	6,258	17,385,582	25.8
	NAM	DeLier, 1955	5,200	22	33	480	16,775,000	34.8
		Rotterdam, 1984	NA	2	2	680	848,000	32.0
		Berkel, 1954	NA	17	17	2,330	4,750,000	20.0
		Ysselm, 1956	5,200	59	86	4,500	88,943,000	22.0
		Pynacker, 1955	NA	4	5	500	5,983,000	22.0
		Wassenaar, 1956	4,200	28	41	1,740	46,535,000	18.7
		Zoetermeer, 1957	3,200	30	30	510	9,786,000	16.5
		Werkendam, 1958	NA	...	...	20	207,000	33.0
		Schoonebeek, 1944	2,500	262	481	9,580	232,097,000	35.6
	CONOCO	Kotter, 1980	6,500	9	11	19,667	24,911,460	33.0
		Logger, 1982	6,500	7	8	12,390	8,746,740	33.5
	AMOCO	● Rijn, 1982	6,600	12	25	12,900	10,980,550	35.0
		Total Netherlands		**478**	**767**	**82,481**	**482,205,099**	
NEUTRAL ZONE(e)	AOC	● Khafji, 1961	4,400-10,300	111	130			28.2
		● Hout, 1969	5,300-10,500	47	67			33.0
	CHEVRON & KOC	Wafra, 1953	1,100- 7,000	312	392	389,000	4,304,878,000	18.9-23.5
		S. Fuwaris, 1963	6,300	6	9			25.0
		S. Umm Gudair, 1966	8,900	16	18			24.3
		Total Neutral Zone		**492**	**616**	**389,000**	**4,304,878,000**	
NEW ZEALAND	SHELL-BP-TODD	● Kapuni, 1959	11,700	8	9			54.0
		● Maui, 1969	11,000	12	14			58.0
	PCNZ	McKee, 1980	7,848- 8,251	17	19			38.5
		Kaimiro, 1982	11,900	1	1	29,000	78,539,000	46.4
		Tariki, 1986	...	1	1			...
		Ahuroa, 1987	...	1	1			...
		Total New Zealand		**40**	**45**	**29,000**	**78,539,000**	

NIGERIA

	Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
AGIP	Akri, 1967	9,600-10,600	2	12	848	59,375,372	43.8
	Akri West, 1972	9,900-10,200	...	2	...	482,258	31.4
	Ashaka, 1968	9,700-12,000	1	1	588	2,343,257	42.2
	Beniku, 1974	12,000	...	2	...	3,309,326	29.5
	Ebegoro, 1976	11,500-12,000	6	9	8,303	59,359,486	40.5
	Ebocha, 1965	8,000-10,900	4	16	5,508	107,790,257	40.4
	Idu, 1973	7,750-10,700	...	10	...	23,862,581	28.0
	Kwale, 1967	10,000-11,500	6	10	4,381	4,694,547	42.4
	M'Bede, 1966	7,300- 9,400	8	20	15,735	157,971,247	44.9
	Obama, 1973	11,600-14,300	6	8	16,240	92,445,019	42.7
	Obiafu, 1967	9,300-12,200	14	20	11,075	79,977,676	45.0
	Obrikom, 19767li	8,000-10,000	6	11	5,527	53,807,211	46.7
	Odugri, 1972	12,500	2	3	333	9,556,180	42.9
	Ogbogene, 1972	10,000	...	2	...	3,302,763	37.0
	Ogbogene W., 1982	13,000	...	1	...	353,136	56.2
	Okpai, 1968	10,000-12,000	8	9	3,129	17,281,882	47.3
	Omoku W., 1975	11,500	1	1	83	4,746,492	38.3
	Oshi, 1972	9,600-11,300	9	10	8,733	62,932,362	40.6
	Tebidaba, 1975	10,300-13,300	7	10	17,661	112,234,712	40.1
	Umuoru, 1975	14,100	2	4	2,049	4,446,722	43.4
	Agwe, 1975	10,800	...	2	12	2,002,300	49.4
	Clough Creek, 1977	10,000-12,400	9	9	7,801	19,738,108	44.4
	● Beniboye N., 1978	9,000-10,000	9	9	8,437	8,313,466	35.5
ASHLAND	Izombe-Ossu, 1974	9,500	17	17	12,641	4,613,854	41.0
	● Akam, 1980	6,700	8	8	8,315	3,035,036	35.2
	● Adanga, 1980	10,611-17,586	8	8	13,262	10,645,430	35.0
ELF	Aghigo, 1972	...	18	19	3,992	22,770,998	24.8
	Okpoko, 1967	...	20	22	7,617	29,653,693	24.8
	Obodo-Jatumi, 1966	...	21	25	17,910	63,216,952	24.8
	Upomini, 1965	...	13	14	3,842	15,580,567	24.8
	Obagi, 1964	...	81	92	43,140	350,235,015	24.6
	Erema, 1972	...	4	5	3,448	9,122,120	24.6
GULF NIGERIA[e]	Abiteye, 1970	5,750- 9,400	12	19			39.7
	● Delta, 1965	5,600- 9,500	22	27			37.3
	● Delta South, 1965	7,100-10,179	18	27			38.4
	● Isan, 1970	5,900- 9,000	4	11			40.4
	Makaraba	7,100-12,005	12	26			27.7
	● Malu, 1969	4,800- 6,300	12	18			40.4
	● Mefa, 1965	8,570-12,030	4	5			38.1
	● Meji, 1965	5,200-10,900	19	22			31.9
	● Meren, 1965	5,000- 7,500	28	51			31.9
	● Okan, 1964	5,500- 9,245	36	67			38.1
	● Parabe/Eko, 1968	4,500- 8,200	11	23			40.4
	Utonana, 1971	7,400- 9,165	2	5			20.4
	● W. Isan, 1971	7,825-10,229	4	9			40.4
	Yorla South, 1974	11,389-12,635	...	2			41.0
	Jisike, 1975	6,300- 7,600	3	4			41.1
	Robertkiri, 1964	11,484-13,190	5	12			40.2
	● Tapa, 1978	8,150-10,842	10	10			39.5
MOBIL[e]	● Adua, 1967	6,970	4	5			30.3
	● Asabo, 1966	5,600	8	14			32.4
	● Ekpe, 1966	8,200	5	17			30.3
	● Ekpe-WW, 1977	6,810	6	6			30.3
	● Eku, 1966	5,420	1	6			30.8
	● Enang, 1968	6,600	18	23			35.1
	● Etim, 1968	6,200	7	9			32.9
	● Idoho, 1966	9,020	3	4			30.8
	● Inim, 1966	5,850	8	10			37.8
	● Mfem, 1967	5,200	3	3			36.1
	● Ubit, 1968	5,400	30	45			36.1
	● Unam, 1968	5,180	6	9			33.5
	● Utue, 1966	5,700	4	7			36.8
	● Isobo, 1968	7,345	3	4			30.8
	● Iyak	...	6	6			38.7
	● Asabo 'D'	...	1	2			35.0
	● Ata	...	...	...			...
	● Oso	...	...	...			...
	● Usari	...	...	...			...
PAN OCEAN (NIGERIA)[e]	Ogharefe, 1973	9,900	8	11			47.4
SHELL[e]	Ugh-Ogini, 1964	5,860	7	17			19.0
	Ugh-Uzere-East, 1960	8,500	11	13			23.0
	Ugh-Uzere-West, 1964	8,500	10	11			23.0
	Ugh-Olomoro, 1963	7,000-10,000	28	32			22.0
	Ugh-Oweh, 1964	12,300	11	11			28.0
	Ugh-Kokori, 1960	8,000- 9,800	22	27			42.0
	Ugh-Afiesere, 1966	8,000- 9,000	31	33			22.0
	Ugh-Eriemu, 1961	12,500	15	16			26.0
	Ugh-Ughelli-East, 1959	11,800	9	11			35.0
	Ugh-Ughelli-West, 1963	7,400-10,200	8	10			21.0
	Ugh-Utorogu, 1964	9,000	13	19			25.0

	Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Ugh-Oroni, 1964	12,000	7	7			22.0
	Ugh-Warri-River, 1961	12,264	2	3			31.0
	Ugh-Evwreni, 1968	10,900	7	11			38.0
	Ugh-Isoko, 1960	...	1	2			19.0
	Forc-Odidi, 1967	10,980	24	29			37.0
	Forc-Opukushi, 1963	7,823	10	14			29.0
	Forc-Jones Creek, 1967	7,000- 9,000	31	34			29.0
	Forc-Opuama, 1973	...	3	5			41.0
	Forc-Egwa, 1967	9,350	13	22			37.0
	Forc-Forcados/Yokri, 1968	10,859	63	83			22.0
	Forc-Batan, 1968	11,000	8	9			27.0
	Forc-Escravos Beach, 1969	8,176	9	13	953,413	10,172,279,000	36.0
	Forc-Otumara, 1969	8,176	25	28			25.0
	Forc-Saghara, 1970	8,590	3	6			31.0
	Forc-Ajuju, 1970	13,324	1	2			27.0
	Forc-Benisede, 1973	...	15	19			23.0
	Node-Sapele, 1970	12,788	13	19			42.0
	Node-Oben, 1972	12,036	18	23			40.0
	Forc-Opukushi N., 1977	...	1	2			30.0
	Abura	...	1	3			44.8
	Rapele	...	1	2			44.4
	Amukpe	...	2	2			38.9
	Osioka	...	2	2			...
	Phl-Bomu, 1958	6,500- 7,500	14	39			36.0
	Phl-Imo River, 1959	5,800-10,000	32	47			32.0
	Phl-Nkali, 1963	12,000	4	10			42.0
	Phl-Elelenwa, 1959	11,000	6	11			39.0
	Phl-Umuechem, 1969	5,800-10,700	8	19			36.0
	Phl-Apara, 1960	9,000	4	8			36.0
	Phl-Bodo-West, 1959	9,700	9	11			29.0
	Phl-Afam, 1956	6,000	8	15			45.0
	Phl-Yorla, 1970	11,917	9	13			44.0
	Phs-Bonny, 1959	12,254	9	15			36.0
	Phs-Cawthorne Channel, 1963	11,000	21	30			38.0
	Phs-Ekulama, 1958	10,483	22	29			32.0
	Phs-Soku, 1958	11,500	15	23			31.0
	Phs-Orubiri, 1971	...	2	6			38.0
	Egb-Oguta, 1965	10,300	9	21			46.0
	Eade-Utapate South, 1974	...	5	11			44.0
	Eade-Opobo South, 1974	...	4	6			44.0
	Ibigwe	...	2	2			...
	Korokoro	...	6	8			34.3
	Otamini	...	3	5			21.8
	Ugada	...	1	1			...
	Ahia	...	8	12			38.2
	Akpor	...	2	3			27.5
	Alakiri	...	12	21			38.2
	Assa	...	2	2			20.7
	Egbema West	...	7	16			42.2
	Ebubu	...	2	8			22.2
	Egbema	...	6	7			35.5
	Cesw-Nun River, 1960	...	4	6			39.0
	Cesw-Etelebou, 1971	12,000	9	9			33.0
	Cesw-Kolo Creek, 1960	12,000	15	25			42.0
	Cesw-Diebu Creek, 1966	...	10	12			43.0
	Phl-Isimiri, 1964	5,900-11,000	4	6			28.8
	Phl-Onne, 1965	10,384	3	3			29.0
	Phl-Obigbo-North, 1963	6,500-10,000	26	37			22.0
	Phl-Ajokpori, 1967	...	2	2			29.0
	Phl-Agbada, 1960	8,000-12,000	37	48			32.1
	Phl-Akuba, 1967	...	1	1			29.0
	Cesw-Adibawa, 1967	11,950	11	23			26.0
	Cesw-Adibawa NE, 1973	...	3	3			26.0
	Cesw-Ubie, 1961	14,380	4	5			28.0
	Phl-Obeakpu, 1975	...	2	4			45.0
	Cosw-Nembe Creek, 1973	...	38	38			35.0
	Phs-Akaso, 1979	...	1	1			30.0
	Bugama Creek	...	3	6			43.0
	Kalaekule	...	7	7			39.6
	Krakama	...	6	10			23.8
	Odeama Creek	...	5	5			33.3
	Tai	...	2	2			37.4
	Obele	...	5	5			...
	Rumuekpe	...	2	3			...
	Enwhe	...	2	2			...
	Akaso		1	1			...
TEXACO-CHEVRON	● Pennington, 1965	5,000-10,400	2	9	1,980	24,377,203	38.2
	● Middleton, 1972	5,000- 7,000	3	7	2,710	14,948,284	36.6
	● North Apoi, 1973	4,000- 8,100	23	26	31,150	150,632,247	35.8
	● Funiwa, 1978	5,000- 7,000	20	22	22,130	35,788,219	38.2
	● Sengana, 1967	...	1	2	7	666,120	46.7
	Total Nigeria		**1,322**	**2,179**	**1,242,000**	**11,787,881,200**	

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
NORWAY	PHILLIPS	● Ekofisk, 1968	10,000	35	38	82,076	910,326,654	41.1
		● West Ekofisk, 1970	10,300	12	12	3,620	81,829,312	43.9
		● Cod, 1968	9,500	6	6	923	19,353,892	55.0
		● Tor, 1970	10,000	8	13	9,624	114,531,350	38.0
		● Albuskjell, 1972	10,400	15	15	2,362	49,738,965	45.0
		● Edda, 1972	10,480-10,600	7	7	803	22,859,793	41.5
		● Eldfisk, 1970	9,350-10,000	32	52	58,106	223,241,326	37.6
	MOBIL	● Statfjord, 1974	7,700	55	86	*602,657	*1,022,483,814	39.0
	AMOCO	● Valhall, 1972	8,200	20	20	59,841	79,826,000	35.0
	CONOCO	● Murchison, 1975	9,900	20	28	14,863	55,950,200	38.0
		● Ula, 1976	11,000	5	5	78,978	34,136,970	39.0
		Total Norway		215	282	913,853	2,614,278,278	
OMAN	PDO	Lekhwair, 1968	4,352	40	57	17,598	57,132,000	37.8
		Natih, 1963	4,788	35	65	23,021	341,981,000	31.0
		Shibkah, 1976	2,591	2	2	296	761,366	31.0
		Fahud, 1964	2,499	138	215	66,586	751,259,000	32.7
		Yibal, 1962	8,465	164	170	145,028	613,558,000	40.2
		Al Huwaisah, 1969	5,320	37	39	16,460	165,710,000	37.0
		Burhaan, 1984	4,011	3	3	610	1,327,000	36.7
		Ghaba North, 1972	2,227	18	24	11,177	49,722,000	35.8
		Saih Nihaydah, 1972	8,700	19	26	29,620	146,651,000	39.0
		Saih Rawl, 1973	9,826	15	24	9,592	87,444,000	41.1
		Qarn Alam, 1972	1,354	4	7	1,050	18,983,000	14.8
		Habur, 1975	5,800	1	2	107	4,315,000	14.8
		Mahjour, 1979	11,700	1	4	579	2,057,000	37.2
		Al Ghubar, 1974	1,916	6	7	2,220	3,699,000	23.5
		Barik, 1974	8,856	3	4	2,000	1,447,000	42.1
		Anzauz, 1984	7,098	3	3	5,321	5,026,000	47.8
		Hasirah, 1984	8,708	5	6	4,850	2,024,000	48.8
		Zauliyah, 1981	8,177	10	15	6,944	10,819,000	45.2
		Wafra, 1983	5,510	2	6	2,025	1,352,000	40.6
		Suwaihat, 1982	6,452	8	11	8,473	7,976,000	36.0
		Bahja, 1984	5,697	4	7	5,120	4,428,000	44.5
		Fayyadh, 1983	3,608	1	1	491	308,000	27.0
		Sayyala, 1981	3,690	11	11	27,645	21,046,000	49.7
		Zareef, 1985	3,264	6	7	6,699	2,963,000	46.9
		Rima, 1979	3,247	34	34	61,623	105,722,000	32.8
		Rasha, 1982	4,310	4	5	1,120	1,025,000	32.8
		Nimr, 1980	3,296	78	78	24,393	10,881,000	21.3
		Karim West, 1982	3,546	15	15	12,215	10,108,000	23.5
		Amal/Amal South, 1973	4,638	29	31	9,888	7,485,000	22.5
		Birba, 1978	8,528	...	2	...	7,280,000	34.0
		Kaukab, 1983	8,282	...	1	761	925,000	35.8
		Marmul, 1977	5,087	174	181	42,558	110,364,000	22.0
		Rahab, 1977	3,237	19	25	3,390	5,372,000	22.0
		Qaharir East, 1978	4,936	1	3	109	667,000	30.6
		Qaharir, 1978	4,536	22	28	7,186	21,048,000	30.6
		Qata, 1979	4,707	9	14	2,007	3,623,000	26.2
		Runib, 1978	3,215	10	11	2,441	925,000	20.3
		Jalmud, 1979	4,236	3	3	710	264,000	21.0
		Jalmud North, 1980	4,255	2	2	341	138,000	21.0
		Jawdah, 1984	3,570	3	3	2,487	1,001,000	22.0
		Mawhoob, 1985	6,562	1	1	131	48,000	25.7
		Ishan, 1984	5,578	2	2	309	113,000	27.5
		Jameel, 1984	5,906	2	2	258	94,000	30.2
		Al Burj, 1987	6,890	1	1	6	2,000	25.7
		Mukhaizna, 1975	3,478	...	1	31	13,000	15.0
		Dhiab, 1985	5,414	6	6	730	270,000	26.5
		Thuleilat, 1986	3,773	5	5	586	214,000	24.0
		Warad, 1985	4,922	3	3	879	331,000	21.4
		Simsim, 1985	5,250	6	7	2,671	975,000	31.5
		Zahra, 1986	6,562	1	1	398	145,000	32.1
	ELF GROUP	Sahmah, 1978	12,400	6	6	5,174	22,739,617	45.1
		Ramlat	...	1	1	106	93,569	...
	OCCIDENTAL	Safah, 1983	6,500	31	32	5,762	4,180,000	37.8
		Total Oman		1,004	1,220	581,782	2,818,034,982	
PAKISTAN	PAKISTAN OILFIELD LTD.	Balkassar, 1946	9,398	2	4	411	31,530,084	26.0
		Joya Mair, 1944	6,900	2	3	373	5,763,597	15.0
		Dhulian, 1936	8,899	14	41	29	41,314,779	48.0
		Khaur, 1915	9,306	1	3	9	4,167,399	33.0
		Meyal, 1968	12,513	8	10	3,228	29,596,654	41.3
	PAKISTAN PETROLEUM LTD.	Adhi,(c)* 1978	9,118- 9,190	...	4	...	1,416,737	56.1
	OGDC	Toot, 1968	14,765	14	15	1,500	9,428,741	38.0
		Fimkassar, 1982	12,337	1	1	17	31,809	39.0
		Tando Alam, 1984	8,203	9	14	3,434	4,586,054	41.4

*Norwegian production share.

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Ghotana, 1986	7,874	2	2	243	116,202	42.1
		Chak-Naurang, 1986	9,187	2	4	150	54,808	14.3
		Thora, 1987	7,546	2	3	784	286,311	...
	UNION TEXAS	Khaskeli, 1981	3,600	5	9	1,525	6,791,500	39.0
		Laghari, 1983	2,500	5	7	7,591	9,966,525	42.0
		Dabhi, 1984	5,500	3	4	1,520	1,406,679	39.0
		Mazari, 1985	3,520	4	4	5,309	2,230,581	43.0
		Other	...	...	12	...	...	31.0-46.0
	OCCIDENTAL	Dhurnal, 1984	13,100	3	6	15,585	15,719,082	38.0
		Total Pakistan		**77**	**146**	**41,708**	**164,407,542**	
PERU	PETROMAR S.A.	● Peña Negra, 1960	3,000- 8,500	168	284	12,296	104,179,142	38.0
		● Lobitos, 1960	3,500- 7,500	115	249	8,322	50,006,041	38.0
		● Litoral, 1955	1,500- 6,000	92	138	2,642	36,409,940	36.0-40.0
		● Providencia, 1967	3,000- 7,000	36	80	1,757	20,834,644	38.0-40.0
		Other	...	4	11	125	197,346	...
	OCCIDENTAL	● Bartra, 1979	8,000- 8,930	10	16	5,240	17,049,168	11.6
		● Capahuari Sur, 1973	11,800-12,900	17	26	10,337	128,708,116	33.2
		● Dorissa, 1978	9,800-10,600	7	12	8,782	34,591,373	30.8
		● Forestal, 1973	9,000- 9,900	8	10	6,663	32,660,815	18.1
		● Huayuri Sur, 1977	10,000-10,800	9	12	4,397	17,406,645	27.1
		● San Jacinto, 1978	7,200- 9,760	12	22	7,027	26,908,128	13.1-23.5
		● Shiviyacu, 1973	9,100-10,100	15	22	23,012	58,561,369	20.4
		● Jibaro, 1974	10,110-10,155	5	6	3,222	6,338,698	10.7
		● Jiberito, 1981	9,000- 9,650	4	5	6,311	9,651,813	10.5
		Other	...	3	11	1,029	2,210,471	...
	OCCIDENTAL/BRIDAS	Talara area	1,343- 6,080	770	1,219	7,226	44,628,171	33.2
	PETROPERU	Talara-Lima area, 1869	2,000- 9,000	2,152	5,975	26,347	945,336,088	34.1
		Corrientes, 1971	10,000-12,600	32	36	22,823	86,601,829	29.8
		Pavayacu, 1972	9,600-11,300	10	14	3,301	15,315,532	30.2
		N. Esperanza, 1980	10,200-10,700	2	3	1,149	4,549,394	44.0
		Yanayacu, 1974	11,400-13,600	7	8	1,295	3,771,578	19.1
		Capirona, 1972	9,800-12,000	5	5	723	3,274,242	25.3
		Valencia, 1975	10,500-11,200	...	2	93	534,339	44.0
		Selva Central	...	46	53	1,460	25,296,888	...
		Total Peru		**3,528**	**8,219**	**165,578**	**1,675,021,770**	
PHILIPPINES	ALCORN	● South Nido, 1977	6,576- 6,885	3	5	684	15,200,730	27.1
	PHILIPPINES	● Matinloc, 1978	6,656- 6,750	5	5	2,684	6,853,496	43.8
	ALCORN PALAWAN	● Cadlao, 1977	5,734- 5,881	2	2	2,085	9,203,358	45.6
		South Tara, 1987	4,335- 4,436	1	1	52	19,078	40.4
		Total Philippines		**11**	**13**	**5,505**	**33,276,662**	
QATAR(e)	QGPC	● Bul Hanine, 1970	6,000	14	15			35.0
		Dukhan, 1940	6,500	116	161			41.1
		● Idd El Shargi, 1960	4,500- 8,250	25	31	282,000	4,044,985,000	35.0
		● Maydan-Mahzam, 1963	7,000	19	24			38.0
		Total Qatar		**174**	**231**	**282,000**	**4,044,985,000**	
RAS al KHAIMAH(e)	CHEVRON	● Saleh, 1983	14,500	5	6	10,000	12,831,000	50.0
		Total Ras al Khaimah		**5**	**6**	**10,000**	**12,831,000**	
SAUDI ARABIA(e)	ARAMCO	Abqaiq, 1940	6,690					37.0
		Abu-Hadriya, 1940	9,340					35.0
		Abu Jiffan	...					...
		● Abu-Safah, 1963	6,600					30.0
		Bakr	...					...
		● Berri, 1964	8,300					32.0-34.0
		Dammam, 1938	4,800					35.0
		Dhib	...					...
		Dibdibah	...					...
		Duhul	...					...
		El Haba	...					...
		Fadhili, 1949	8,050					39.0
		Farhah	...					...
		Faridah	...					...
		Ghawar, 1948	6,920					34.0
		Habari	...					...
		● Hamur	...					...
		Harmaliyah, 1971	8,430					35.[illegible]
		● Harqus	...					...
		● Hasbah	...					...
		Jaham	...					...

*Field was shut in. Normal maintenance operations continue.

		Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Jaladi	...					...
		● Jana	...					...
		Jauf	...	588	588	4,027,000	54,147,214,000	...
		Jawb	...					...
		Juraybi'at	...					...
		● Jurayd	...					...
		● Karan	...					...
		Khurais, 1957	5,200					33.0
		Khursaniyah, 1956	6,560					31.0
		● Kurayn	...					...
		● Lawhah	...					...
		Lughfah	...					...
		● Maharah	...					...
		● Manifa, 1957	7,950					...
		● Marjan, 1967	6,800					33.0
		Mazalij	...					...
		Qatif, 1945	7,100					33.0-34.0
		Qirdi	...					...
		● Ribyan	...					...
		Rimthan	...					...
		● Safaniya, 1951	5,100					27.0
		Sahba	...					...
		Samin	...					...
		Sharar	...					...
		Suban	...					...
		Tinat	...					...
		Wari'ah	...					...
		Watban	...					...
		● Zuluf, 1965	5,800					32.0
		Total Saudi Arabia		**588**	**588**	**4,027,000**	**54,147,214,000**	
SHARJAH	CRESCENT[e]	● Mubarek,[c] 1972	...	4	4	23,460	85,659,800	37.0
	AMOCO	Saaja and Moveyid,[c] 1980	10,200-12,300	16	16	41,540	91,958,000	50.0
		Total Sharjah		**20**	**20**	**65,000**	**178,617,800**	
SPAIN	SHELL ESPANA	● Amposta Marino Norte, 1970	10,000	2	3	1,050	55,379,101	37.0
		● Tarraco (Castellon B5/8), 1973	9,000	...	3	...	14,547,234	35.0
	CHEVRON	Ayoluengo, 1964	4,600- 5,200	35	51	1,328	14,709,350	33.0
	REPSOL	● Casablanca, 1975	8,900	7	9	29,368	79,407,563	32.6
		● Dorada, 1975	6,700	...	4	...	16,565,228	21.5
		● Gaviota,[c] 1980	8,300	3	3	1,242	598,443	52.7
		● Salmonete, 1984	12,600	...	1	...	1,529,323	44.0
		Angula, 1984	12,600	...	1	...	46,636	44.0
		Total Spain		**47**	**75**	**32,988**	**182,782,878**	
SURINAME	STAATSOLIE	Tambaredjo, 1981	1,010	74	74	2,176	2,244,700	15.9
		Total Suriname		**74**	**74**	**2,176**	**2,244,700**	
SYRIA	AL FURAT OIL CO./SHELL	Thayyem, 1983	NA	...	...	61,450	34,629,000	36.5
		Al Kharrata, 1986	NA	...	...	380	139,000	37.5
	SPC[e]	Alian, 1974	5,900	25	37			19.0
		Gbebeh, 1976	2,300	54	75			18.0
		Jebisseh, 1968	2,000- 3,300	132	219			18.0
		Karachok, 1956	6,500	103	119	168,170	999,732,000	20.0
		Rumilan, 1962	6,500	59	66			24.0
		Soudie, 1959	6,500	532	579			24.0
		Tichrine, 1976	2,600	58	73			18.0
		Total Syria		**963**	**1,168**	**230,000**	**1,034,500,000**	
THAILAND	UNOCAL	● Erawan,[c] 1973	7,000	88	119	6,356	14,446,200	54.6
		● Baanpot,[c] 1980	7,000	20	21	438	1,180,400	54.6
		● Platong,[c] 1976	8,500	29	43	3,647	4,084,700	59.1
		● Satun,[c] 1980	8,500	56	58	4,728	4,020,500	55.1
	THAI SHELL	Sirikit, 1981	5,258- 5,976	50	61	16,180	27,865,000	41.0
		Sirikit West, 1983	5,500	2	2	500	474,000	41.0
		Pru Krathiam, 1984	...	...	2	30	11,000	19.0
		Total Thailand		**245**	**306**	**31,879**	**52,081,800**	
TRINIDAD	AMOCO	● Teak, 1971	15,191	57	97	33,861	227,983,000	29.3
		● Samaan, 1971	11,780	34	54	12,901	174,129,000	36.8
		● Poui, 1974	11,650	33	57	20,454	150,192,000	34.0
		● Cassia, 1973	12,700	7	8	6,081	10,531,000	45.0
		Mora, 1986	8,500	3	5	677	414,000	...

		Name of field, discovery date	Depth, ft	No. of wells — Producing	No. of wells — Total	Production — 1987 average B/d	Production — Cumulative to Dec. 31, 1987 Bbl	°API gravity
	TNA	● Soldado, 1955	11,000	354	655	37,648	462,680,000	...
		● Fortin Offshore (FOS), 1954	...	12	35	287	7,001,000	...
	TRINTOPEC	Palo Seco/Erin/McKenzie, 1926	12,718	519	1,576	8,598	117,001,000	...
		Fyzabad/Apex/Quarry, 1920	11,000	323	1,039	4,130	170,550,000	...
		Coora/Quarry, 1936	14,000	186	733	2,133	91,180,000	...
		Galeota, 1963	6,304	53	105	2,930	15,218,000	...
		Central Los Bajos, 1973	...	136	218	2,557	8,488,000	...
		Other	...	199	914	2,407	60,884,000	...
	TRINTOC	Area IV & Guapo, 1913	10,626	83	192	1,326	38,709,000	...
		Parrylands, 1913	10,626	124	508	1,667	40,127,000	...
		Point Fortin C & W. 1907	10,626	125	551	2,318	40,707,000	...
		Point Fortin E., 1929	11,000	...	168	...	26,353,000	...
		Penal, 1936	11,067	70	289	975	62,042,000	...
		Catshill, 1950	9,693	32	134	337	23,027,000	...
		Brighton, 1908	7,500	62	619	678	72,675,000	...
		Barrackpore, 1911	11,100	67	369	2,283	30,817,000	...
		Guayaguayare, 1902	10,750	107	699	1,729	86,477,000	...
		Forest Reserve, 1913	11,000	294	2,042	4,976	259,156,000	...
		Oropouche, 1944	9,100	32	128	171	6,639,000	...
		Palo Seco, 1929	12,700	87	933	2,207	93,122,000	...
		Trinity, 1956	9,700	18	95	233	15,131,000	...
		Other	...	139	813	969	80,637,000	...
	PCOL	All fields	...	99	494	645	20,568,000	...
		Total Trinidad		**3,255**	**13,530**	**155,178**	**2,302,438,000**	
TUNISIA	ELF-ETAP	● Ashtart	10,500	14	19	19,880	169,685,984	29.8
	ELF-SEREPT	Douleb/Semmama	3,937	13	15	779	17,700,000	40.0
		Tamesmida	3,937	3	3	223	2,018,000	36.9
	CFPT	Sidi El Hayem, 1971	7,500- 7,800	21	23	3,054	21,411,533	44.0
	SHELL	● Tazerka, 1979	4,111- 4,232	5	6	4,720	13,323,000	30.0
	ETAP-AGIP-FINA (SODEPS)	Makrouga, 1980	6,230	3	4	3,328	4,096,740	45.0
		Larich, 1979	7,550	2	2	102	243,372	40.7
		Debech, 1980	7,550	1	1	64	233,099	42.6
	AGIP-TUNISIA (SITEP)	El Borma, 1964	8,250- 8,900	87	113	70,580	496,300,000	42.5
		Chouech es Saida, 1971	12,600	1	1	372	2,400,000	42.9
	TENNECO	El Hajeb, 1982	6,890	2	2	980	1,010,000	30.5
		Total Tunisia		**152**	**189**	**104,082**	**728,421,728**	
TURKEY	SHELL	Barbes, 1971	4,600	17	19	1,808	15,700,000	29.7
		Baysu, 1985	3,250	3	3	578	428,000	33.3
		Bektas, 1985	3,250	1	1	246	264,000	33.7
		Beykan, 1965	2,700	37	41	3,403	58,790,000	33.2
		Cobantepe, 1975	4,000	1	1	8	176,000	32.8
		Katin, 1971	4,800	3	3	107	3,688,000	29.5
		Kayakoy, 1961	3,500	14	20	1,241	19,313,000	38.2
		Kayakoy-West, 1965	2,900	18	18	3,014	28,700,000	34.7
		Kervan, 1982	3,800	1	1	25	22,000	30.3
		Kurkan, 1962	2,125	29	31	2,467	48,465,000	31.4
		Kurkan-South, 1968	2,900	5	5	489	6,550,000	34.5
		Malatepe, 1970	2,350	14	14	941	6,522,000	32.7
		Piyanko, 1968	4,200	1	1	79	1,485,000	35.5
		Sahaban, 1966	2,900	7	10	655	12,910,000	34.5
		Sahaban South East, 1983	2,900	2	2	177	316,000	34.5
		Sincan, 1980	2,125	9	9	980	2,830,000	31.4
		Yatir-East, 1974	1,908	9	10	592	5,057,000	30.9
		Yenikoy-East, 1974	3,700	2	2	860	3,925,000	31.3
		Yesildere, 1985	3,250	2	2	366	240,000	34.7
	MOBIL	Selmo, 1964	5,800	21	21	4,451	65,323,748	34.2
		Bulgurdağ, 1961	4,500	2	3	41	2,467,145	37.9
	TPAO	Raman, 1940	4,500	82	87	4,818	48,683,893	18.7
		Bati Raman, 1961	4,200	74	85	3,396	34,037,592	13.3
		Garzan, 1956	4,700	21	21	1,460	33,115,229	26.2
		Germik, 1968	6,500	8	10	407	3,293,783	18.8
		Mağrip, 1961	5,700	10	11	681	14,591,351	18.4
		Silivanka, 1962	8,200	10	10	836	7,633,478	23.0
		Beycayir, 1976	7,700	1	1	26	186,155	26.1
		Celikli, 1964	10,500	11	12	2,408	2,955,167	35.2
		Sezgin, 1970	5,600	...	...	...	87,559	17.0
		Oyuktas, 1972	7,600	...	...	...	592,005	31.0
		Devecatak, 1973	4,800	1	1	23	222,722	37.0
		K. Osmancik, 1971	3,800	2	2	204	2,004,177	37.6
		Adiyaman, 1971	5,800	10	11	702	8,025,831	27.6
		G. Adiyaman, 1977	5,000	...	...	...	115,836	20.4
		Kuzey Adiyaman, 1977	9,500	...	...	...	59,325	32.0
		Bölükyayla, 1977	10,300	...	...	...	167,663	35.0

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Saricak, 1973	5,250	3	3	195	2,550,062	31.5
		G. Saricak, 1973	5,250	11	12	659	3,819,626	31.5
		Yeniköy, 1973	6,400	16	16	1,370	8,437,870	31.4
		G. Kayaköy, 1976	8,600	5	5	4,675	2,032,804	30.4
		Sivritepe, 1977	8,200	2	2	94	509,731	33.4
		Camurlu, 1976	5,600	18	18	477	863,514	12.2
		Ikiztepe, 1976	4,900	...	...	...	88,051	11.3
		G. Sahaban, 1978	5,450	13	13	1,429	2,525,466	33.2
		G. Dincer, 1981	5,350	10	11	727	4,281,313	16.7
		B. Selmo, 1981	5,500	1	1	198	470,682	34.0
		Mehmetdere, 1982	6,700	...	...	...	149,057	31.0
		Karaltepe, 1982	6,550	4	4	342	751,850	32.0
		Cemberlitas, 1983	6,500	18	21	4,195	6,001,201	30.5
		Alcik, 1983	6,500	1	1	24	69,399	32.0
		Cukurtas, 1985	10,000	1	1	26	200,804	36.0
		B. Kozluca, 1985	5,000	18	21	1,667	787,648	12.0
		Akpinar, 1984	10,500	2	4	141	99,062	31.6
		B. Firat, 1986	8,150	5	7	1,315	633,800	34.8
		Kurtalan, 1961	5,750	1	1	22	236,217	31.9
		S. Sinan, 1987	3,900	1	1	12	4,250	13.0
	ALADDIN MIDDLE EAST LTD.[a]	Kahta, 1958	3,500	10	23	130	4,041,000	11.0
		Yasince, 1974	6,400	2	4	10	4,650	31.0
		Total Turkey		**571**	**638**	**55,187**	**477,501,716**	
UNITED KINGDOM	**AMOCO**	• Montrose, 1969	8,200	16	20	11,345	74,712,198	40.5
		• NW Hutton, 1975	12,000	20	29	32,370	81,694,979	36.0
	BP	Wytch Farm Bridport Sand, 1974	2,910	11	16	6,000	13,576,000	37.0
		Wytch Farm Sherwood Sandstone, 1977	5,115					38.0
		East Midlands, 1939	3,500	71	129	1,280	24,941,994	36.0
		Kimmeridge, 1960	1,800	...	...	...	...	40.0
		Welton, 1983	5,000	14	19	2,310	1,601,240	36.0
		Nettleham, 1983	8,850	1	2	346	334,601	35.0
		• Forties and Echo, 1970	7,000	78	103	327,000	1,802,600,000	37.0
		• Buchan, 1974	8,700	9	9	21,000	59,157,572	33.0
		• Magnus, 1974	9,500	11	20	127,000	194,576,010	39.0
	BRITOIL	Thistle, 1973	9,200	33	60	56,050	316,328,503	38.5
		Beatrice (A + B), 1976	6,750	25	44	33,332	89,225,571	38.4
		Clyde, 1978	12,000	10	30	32,568	11,920,031	38.1
		Deveron, 1972	13,500	3	*...	5,836	8,159,530	38.0
	CHEVRON	• Ninian, 1974	10,000	69	102	153,352	759,533,710	35.0
	CONOCO	• Statfjord,† 1974	9,500	57	88	114,623	193,754,230	39.0
		• Murchison,† 1975	9,900	20	28	52,090	182,883,940	38.0
		• Hutton, 1973	10,000	16	26	61,033	79,950,045	33.0
		• Dunlin, 1973	9,100	23	34	51,743	254,272,195	36.0
	HAMILTON BROS. OIL & GAS LTD.	• Argyll, 1971	9,000- 9,400	7	7	9,050	63,400,000	38.0
		• Duncan, 1980	9,600-10,000	3	5	4,840	16,500,000	36.0
		• Innes, 1983	12,300-12,600	2	2	2,740	4,300,000	45.0
	MARATHON	• South Brae Crude Oil, 1975	12,700-13,437	19	27	97,535	141,917,809	35.0
	MOBIL	• Beryl, 1972	9,900-11,500	43	56	91,830	355,234,746	37.4
		Ness, 1986	9,900-10,112	2	2	15,576	2,237,306	37.5
	OCCIDENTAL	• Claymore, 1974	8,100	25	27	79,233	310,655,000	30.1
		• Piper, 1973	8,100	25	27	165,396	810,261,000	37.0
		• Scapa, 1981	8,100	3	3	20,600	12,308,000	32.0
	SHELL	• Auk, 1971	NA	10	11	11,080	76,644,000	38.0
		• Brent, 1971	NA	59	66	338,900	1,060,198,000	37.8
		• Cormorant S. & C., 1972	NA	8	13	39,890	93,560,000	36.0
		• Cormorant North, 1974	NA	14	15	87,270	162,854,000	34.9
		• Dunlin A, 1973	NA	29	31	51,530	250,706,000	[illegible]
		• Fulmar, 1975	NA	9	14	152,240	263,468,000	40.0
	PHILLIPS	• Maureen, 1973	8,000- 8,700	3	12	68,649	113,760,238	36.0
	TEXACO NORTH SEA	• Tartan, 1974	10,217-12,614	8	15	35,110	60,211,713	37.0-42.0
		• Highlander, 1976	8,759- 9,372	4	5	28,060	27,699,604	34.0-37.0
		• Petronella, 1975	7,269- 8,037	1	1	10,372	4,036,700	40.1
	UNOCAL	• Heather, 1973	10,800	26	37	18,512	74,501,902	34.3
		Total United Kingdom		**787**	**1,138**	**2,417,781**	**8,082,878,347**	
VENEZUELA	**PDVSA/ZULIA**	Boscan, 1946	...	500	520	27,000	730,129,000	10.4
		Bachaquero, 1930	...	4,103	4,223	252,560	5,105,880,000	23.2
		Cruces-Manuelas, 1916	3,000- 8,000	266	284	2,300	173,117,000	39.2

*Included in Thistle total.
†U.K. share of production.

	Name of field, discovery date	Depth, ft	No. of wells Producing	No. of wells Total	Production 1987 average B/d	Production Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Cabimas, 1917	2,200	832	832	60,000	468,973,000	22.8
	Centro, 1959	9,600-11,000	259	279	119,000	838,640,000	36.2
	La Concepcion, 1953	3,148- 8,000	218	238	4,330	136,255,000	34.5
	La Paz, 1925	4,268- 8,000	199	199	19,000	855,108,000	30.6
	Lago, 1959	11,450	117	116	15,000	1,700,474,000	32.0
	Lagunillas, 1926	3,000	5,393	5,581	142,380	3,902,898,000	25.6
	Lama, 1957	8,320	296	310	136,000	2,445,142,000	32.5
	Lamar, 1958	13,000	220	241	65,000	189,063,000	35.5
	Mara, 1945	5,240	147	148	4,400	406,198,000	24.0
	Mene Grande, 1914	4,130	779	779	5,500	637,648,000	18.4
	Motatan, 1952	...	36	36	10,600	71,846,000	20.2
	Sibucara, 1948	13,450	10	10	402	43,406,000	30.8
	Tia Juana, 1928	3,000	3,520	3,551	221,000	10,360,221,000	18.2
	Urdaneta, 1970	10,000	40	285	23,000	122,508,000	26.7
	West-Tarra, 1942	4,250- 5,500	17	44	2,000	61,690,000	39.2
	Ceuta	...	194	203	54,000	446,771,000	30.6
	Other	...	43	124	41,300	107,205,000	...
PDVSA/ANZOATEGUI	Boca, 1971	9,500	107	112	800	79,748,000	32.2
	Caico Seco, 1946	6,500- 7,300	189	192	2,800	8,826,000	33.1
	Chimire, 1948	7,000- 7,200	267	292	4,500	257,059,000	34.6
	Decion, 1957	6,700	159	171	5,370	223,932,000	21.8
	Elias, 1954	5,000- 6,470	249	265	6,670	424,932,000	37.5
	El Roble, 1939	3,500-11,500	70	70	2,700	38,250,000	50.0
	Guara, 1946	5,000-10,000	625	648	12,000	424,932,000	25.7
	Inca, 1948	7,250	71	72	1,000	1,545,000	28.2
	Leona, 1938	2,200-12,800	423	429	7,300	50,828,000	24.7
	La Ceiba, 1946	9,450	45	45	2,460	47,582,000	42.4
	Mata, 1954	8,970-10,516	485	547	8,800	18,310,000	32.5
	Merey, 1937	5,400- 5,700	775	790	19,700	34,938,000	12.4
	Nipa, 1945	6,000- 8,500	394	412	13,000	163,421,000	28.0
	Oscurote-Norte, 1952	9,513	83	88	700	109,739,000	19.2
	Oficina, 1937	5,900	976	1,047	10,750	381,194,000	22.6
	Soto, 1950	9,500	85	87	1,400	95,643,000	37.8
	Sta. Ana, 1936	8,500	134	143	4,400	119,683,000	42.6
	San Joaquin, 1939	6,550	137	137	5,400	108,031,000	48.8
	Sta. Rosa, 1941	8,500	242	271	13,900	390,012,000	50.4
	Yopales, 1937	4,600	390	406	11,[illegible]00	127,328,000	23.6
	Zanjas, 1958	13,270	18	21	2,600	40,252,000	41.0
	Zapatos, 1955	11,500	74	83	3,600	256,253,000	35.9
	Zorro, 1953	11,100	30	36	2,000	74,630,000	35.9
	Zulus, 1957	12,710	28	29	1,250	23,286,000	42.1
	Zumo, 1954	9,200	38	41	1,300	77,486,000	26.3
	La Ceibita, 1963	9,878	56	66	2,400	64,889,000	41.8
	Adjuntas, 1957	5,000	28	717	...	...	13.9
	Arecuna	...	141	142	2,200	7,662,000	11.2
	Bare	...	279	286	1,450	15,159,000	10.3
	El Toco	...	52	53	2,000	30,111,000	52.2
	Guario	...	82	83	1,700	43,045,000	43.8
	Isla	...	26	27	2,700	57,905,000	43.5
	Other	...	70	432	14,000	392,013,000	...
PDVSA/MONAGAS	Acema, 1960	...	74	75	15,000	22,325,000	29.0
	Aguasay, 1955	8,100-13,400	17	43	4,800	14,382,000	31.3
	Jobo, 1956	3,600- 4,000	452	465	30,300	269,850,000	11.0
	Morichal, 1958	3,312	237	253	3,600	168,847,000	8.7
	Orocual, 1953	2,954	79	81	3,000	29,043,000	25.1
	Oritupano, 1950	7,657	269	279	3,400	39,681,000	19.1
	Pirital, 1958	450- 1,100	42	81	330	27,372,000	30.2
	Quiriquire, 1928	7,000- 7,200	661	671	1,150	760,239,000	23.5
	Sta. Barbara, 1941	5,020- 6,500	254	268	1,000	160,292,000	24.2
	Tacat, 1953	1,820- 3,670	151	157	150	44,691,000	18.2
	Temblador, 1936	3,500- 4,500	128	135	1,700	109,106,000	19.5
	Aguasay N.	...	60	64	6,200	5,300,000	45.4
	Acema-Casma	...	75	77	18,200	27,407,000	24.1
	Cerro Negro	...	323	324	14,500	11,541,000	8.6
	Mata Acema	...	26	26	11,000	287,667,000	24.0
	Onado	...	29	30	4,500	17,472,000	27.7
	Oritupano N.	...	38	40	5,200	23,586,000	28.4
	Pilon	...	42	147	12,000	150,505,000	12.3
	Furrial, 1985	16,000	5	5	20,000	6,660,000	28.0
	Musipan, 1985	16,500	1	1	7,000	655,000	32.0
	Other	...	20	200	5,000	120,768,000	...
PDVSA/BARINAS	Hato, 1965	9,550	13	18	2,200	43,357,000	24.4
	Maporal, 1957	10,950	15	17	2,900	15,004,000	26.7
	Paez, 1963	...	59	70	8,000	52,325,000	19.6
	Silvan, 1949	10,860	15	23	3,600	48,539,000	29.0
	Silvestre, 1948	8,860	29	58	4,300	136,253,000	2[illegible].6
	Sinco, 1953	8,500- 9,100	56	93	10,300	264,843,000	23.7
	Other	...	...	...	...	6,300,000	...

		Name of field, discovery date	Depth, ft	No. of wells — Producing	No. of wells — Total	Production — 1987 average B/d	Production — Cumulative to Dec. 31, 1987 Bbl	°API gravity
	PDVSA/GUARICO	Budare, 1958	4,523	55	58	2,840	66,442,000	29.6
		Las Mercedes, 1942	4,500	377	445	82	91,318,000	22.8
		Ruiz, 1949	4,500	64	90	50	33,185,000	29.9
		Barzo	4,500	12	12	10	4,005,000	29.0
		Bella Vista	4,500	91	112	40	12,347,000	21.6
		Jobal, 1960	4,500	15	16	10	2,126,000	36.3
		Saban	4,500	128	163	50	22,044,000	41.1
		Guafita, 1984	8,500	14	14	56,000	12,838,000	29.0
	PDVSA/AMACURO	Tucupita, 1945	...	6	96	54	67,074,000	16.6
	PDVSA/FALCON	All fields, 1920	500-12,000	152	165	...	107,133,000	25.0-52.0
		Total Venezuela		**28,101**	**31,115**	**1,635,488**	**36,274,363,000**	
WEST GERMANY	WINTERSHALL A.G.[a]	Emlichheim, 1944	3,116	74	130	21,253	497,243,766	24.5
		Ruehlertwist, 1949	2,919	72	134			25.0
		Aldorf, 1952	4,100	48	106			33.0
		Bockstedt, 1954	4,264	34	48			27.4
		Dueste, 1954	3,936	33	71			33.0
		Pattensen, 1954	2,165	5	7			29.3
		Landau, 1955	3,936	73	78			36.9
		Sohnedeneck, 1956	5,182	19	29			27.5
		Ruelzheim, 1984	7,544	2	2			37.7
		Rheinzabern, 1959	5,576	1	1			37.9
		Moenchsrot, 1958	5,248	15	23			38.1
		Kirchdorf, 1982	5,737	1	1			38.5
		Oberschnarzach, 1978	4,920	4	4			37.7
		Arlesried, 1964	4,920	11	20			38.5
		Maximiliansau, 1959	5,363	1	1			41.0
		Hauerz, 1985	8,639	5	5			40.4
		Meckelfeld, 1954	6,396	21	28			27.5
		Dickel, 1953	3,936	37	60			28.3
		Nienhagen, 1925	3,729	12	12			30.0
		Wathlingen, 1939	2,624	8	9			30.0
		Eicklingen, 1937	2,460	12	13			30.0
		Schwabmunchen, 1976	4,428	1	1			25.7
		Aitingen, 1977	6,232	4	4			31.1
	OTHER OPERATORS[a]	Scheerhorn, 1949	3,550- 3,750	932	1,630			30.0
		Reitbrook, 1937	1,450- 2,100					29.0
		Oelheim-Sued, 1968	7,650					33.0
		Sinstorf, 1960	6,750- 7,150					...
		Vorhop, 1952	2,950- 6,900					36.0
	DEUTSCHE TEXACO AG	Boostedt, 1952	5,900	25	41	662	18,178,547	32.0
		Ploen-Ost, 1958	8,850	31	62	1,160	50,716,673	33.0
		Preetz, 1962	8,200	19	30	345	11,527,580	26.0
		• Schwedeneck-See, 1978	4,900	15	15	7,749	7,617,042	28.0
		Hankensbuettel-Sued, 1954	4,900	43	82	2,376	81,818,047	27.0-35.0
		Hardesse, 1957	8,200	31	69	549	8,667,754	40.0
		Oerrel-Sued, 1954	4,600	24	46	1,081	11,404,076	26.0
		Hohne, 1951	5,250	29	55	834	40,639,319	33.0
		Lieferde, 1956	2,600	22	42	348	20,261,379	33.0
		Wesendorf, 1943	4,650	18	36	304	17,394,007	25.0-40.0
		Mittelplate, 1987	7,500- 9,350	4	4	836	305,271	19.3
		Other, 1935	2,300- 8,200	27	69	518	30,513,974	19.0-37.0
	MOBIL ERDGAS-ERDÖL GMBH (MEEG)	Hofolding, 1980	11,100	2	3	468	581,148	28.0-30.0
		Bavaria	4,660- 6,190	2	31	1	7,526,952	20.0-25.0
		Hannover	980- 6,630	46	70	859	20,243,280	25.0-31.0
		Viogtei, 1953	980- 1,900	77	10[illegible]	633	25,923,571	32.0-34.0
		Süd-Oldenburg, 1950	2,630- 6,800	76	153	1,187	39,518,517	31.0-3[illegible].0
		Weser Ems	2,000- 2,450	16	25	260	5,984,259	24.0
	BEB	Annaveen, 1963	4,428	3	4	17	490,240	33.8
		Barenburg, 1953	2,706	45	73	2,240	38,862,348	31.1
		Barver, 1963	3,640	3	5	39	484,081	32.8
		Dodenteich, 1960	4,641	1	2	15	350,491	31.1
		Eich, 1983	5,995	5	8	725	780,891	38.9
		Eilte-West, 1956	6,051	13	16	94	3,526,095	32.8
		Eldingen, 1949	5,028	38	45	275	20,659,451	35.5
		Elsfleth, 1956	5,175	3	13	44	2,843,467	25.7
		Eystrup 3-6, 1959	1,075	4	4	149	1,109,904	17.4
		Eystrup 2, 1960	3,526	1	1	14	440,007	17.4
		Eystrup-Verden, 1977	3,526	1	4	7	172,143	17.1
		Georgsdorf, 1943	2,653	212	369	5,600	100,618,330	23.8
		Gross-Lessen, 1969	3,280	7	11	834	21,223,931	29.8
		Hankensbüttel, Mitte, 1954	5,182	6	8	158	4,280,434	33.0
		Hankensbüttel-Nord, 1955	5,182	4	4	327	6,242,108	33.0
		Hankensbüttel Ost, 1954	5,182	1	1	55	1,254,636	33.0
		Hebelermeer, 1955	3,899	10	15	130	4,492,425	27.3

Steamflood aids production from a deep, highly fractured carbonate reservoir in Wyoming for Marathon Oil Co. (photo courtesy of Marathon.)

				No. of wells		Production		
		Name of field, discovery date	Depth, ft	Producing	Total	1987 average B/d	Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Hillerse-Nord, 1958	2,683	1	1	7	764,693	31.5
		Hillerse-West, 1957	6,077	1	1	3	28,790	43.1
		Hohenassel, 1943	1,705	13	28	43	3,511,514	30.4
		Hohnebostel, 1969	8,341	3	6	70	1,181,756	41.0
		Königsgarten, 1984	6,235	0	3	108	63,854	38.1
		Lingen-Dal. (incl. Wd), 1942	3,129	89	148	216	16,882,629	31.1
		Lüben, 1955	4,100	8	11	749	11,998,436	33.0
		Lüben-West, 1958	4,690	5	6	147	1,463,259	36.9
		Meerdorf, 1954	6,077	16	27	99	1,593,134	43.1
		Meppen-Schwefingen, 1959	4,257	22	24	937	12,134,969	29.8
		Mölme-Feldbergen, 1934	1,410	2	2	11	508,466	31.1
		Mölme-Wachtel, 1934	3,886	2	18	2	758,642	36.9
		Nienhagen, 1909	3,079	8	30	107	26,835,081	29.6
		Nienhagen-Dachtmissen, 1959	3,427	6	8	90	998,833	27.8
		Pfullendorf-Ostrach, 1962	3,558	15	24	129	2,498,576	37.7
		Pötrau, 1959	5,248	...	2	...	30,187	14.3
		Rühlermoor-Malm, 1962	4,519	4	10	121	6,408,949	31.7
		Rühlermoor-Valendis, 1949	2,381	283	453	9,069	132,109,053	24.6
		Rühme, 1954	2,361	39	48	740	10,468,482	33.4
		Steimbke-Alt + Nord, 1935	1,246	29	41	102	7,698,424	20.6
		Steimbke-Lichtenmoor, 1943	2,722	17	34	124	3,885,967	17.4
		Steimbke-Ost, 1959	4,428	4	11	51	3,798,042	30.5
		Stockstadt, 1952	5,402	9	22	119	7,721,109	39.6
		Suderbruch, 1949	5,175	49	73	527	23,336,008	31.1
		Sulingen, 1973	3,345	9	9	553	5,036,459	30.0
		Varel, 1957	5,084	6	15	135	5,712,723	25.5
		Varloh, 1984	4,129	6	6	226	118,368	31.5
		Volkensen, 1960	7,540	4	5	75	743,953	22.9
		Wald, 1966	3,116	...	4	...	51,025	28.2
		Wehrbleck, 1957	3,342	56	67	722	16,289,366	32.0
		Wietingsmoor, 1954	2,820	24	32	540	12,968,076	30.5
	DST	Bramberge, 1958	2,600	58	73	6,075	101,649,164	28.0
		Fronhofen, 1964	3,800	9	15	238	2,360,472	37.0
		Illimensee, 1967	3,800	2	6	39	983,981	37.0
		Memmingen-M, 1958	5,000	...	7	...	446,484	37.0
		Markdorf, 1960	7,700	...	1	...	13,912	37.0
		Total West Germany		**3,088**	**5,210**	**74,800**	**1,535,218,000**	
YEMEN, NORTH	HUNT OIL	Alif, 1984	5,700	12	76	18,800	9,514,000	40.0
		Azal, 1987	6,850	...	9	...	...	40.0
		Total North Yemen		**12**	**85**	**18,800**	**9,514,000**	
ZAIRE	CHEVRON	● GCO, 1970	7,000- 9,000	6	8	244	6,228,697	29.0
		● Mibale, 1973	5,000- 6,000	7	8	13,824	81,266,684	30.0
		● Mwambe, 1979	6,150	2	2	174	638,862	30.4
		● Motoba, 1976	11,098	4	4	2,848	1,693,960	44.3
		● Lukami, 1983	12,400	3	5	3,336	6,170,507	35.0
		● Libwa, 1981	5,500	...	2	...	...	33.0
	ZAIREP (FINA)	East Mibale, 1978	6,000	...	1	...	397,637	34.0
		Kinkasi, 1972	3,700	40	42	3,134	6,287,706	31.0
		Liawenda, 1972	3,900	27	32	2,056	4,764,380	31.0
		Nsiamfumu, 1977	8,300	...	1	...	5,347	34.0
		Kifuku, 1983	3,400	1	1	25	37,688	31.0
		Makelekese, 1983	3,600	8	8	491	737,007	31.0
		Muanda, 1972	3,600	6	6	547	536,119	31.0
		Tshiende, 1978	6,000	6	7	4.693	3,930,966	34.0
		Total Zaire		**110**	**127**	**31,372**	**112,695,560**	

Worldwide refining

Debra A. Gwyn
Director of Editorial Surveys

All figures in barrels per calendar day

All figures are as of 1-1-89

LEGEND

Numbers identify processes in table

Thermal processes
1. Gas oil cracking
2. Thermal cracking
3. Visbreaking
4. Fluid coking
5. Delayed coking
6. Other

Catalytic cracking
1. Fluid
2. Other

Catalytic reforming
- Semiregenerative:
  1. Conventional catalyst
  2. Bimetallic catalyst
- Cyclic:
  3. Conventional catalyst
  4. Bimetallic catalyst
- Other:
  5. Conventional catalyst
  6. Bimetallic catalyst

Catalytic hydrocracking
1. Distillate upgrading
2. Residual upgrading
3. Lube-oil manufacturing
4. Other

Catalytic hydrorefining
1. Residual desulfurization
2. Heavy gas oil desulfurization
3. Cat cracker and cycle stock feed pretreatment
4. Mid distillate
5. Other

Catalytic hydrotreating
1. Pretreating cat reformer feeds
2. Naphtha desulfurizing
3. Naphtha olefin or aromatics saturation
4. Straight-run distillate
5. Other distillates
6. Lube oil "polishing"
7. Other

Alkylation
1. Sulfuric acid
2. Hydrofluoric acid

Aromatics/Isomerization
1. BTX
2. Hydrodealkylation
3. Cyclohexane
4. C_4 feed
5. C_5 feed
6. C_5 and C_6 feed

Hydrogen
1. Steam methane reforming
2. Steam naphtha reforming
3. Partial oxidation
4. Cryogenic
5. Other

Calendar-day figures reported in this survey are the average volume a refinery unit processes each day including downtime used for turnarounds. This is actual total volume for the year divided by 365. (Stream day figures represent the amount a unit can process when running full capacity for short periods.)

INACTIVE REFINERIES

Germany
1. Erdol Raffinerie Duisburg GmbH, Duisburg, 37,800 b/cd.

Italy
2. ERG SpA, Genoa, San Quirico, 130,000 b/cd.

Japan
3. Asia Oil CL, Yokohama, Kanagawa, no crude distillation; Cat reforming: 12,600 b/cd; Cat hydrorefining: 28,800 b/cd; Cat hydrotreating: 39,100 b/cd.
4. Cosmo Oil CL, Matsuyama, no crude distillation; Cat reforming: 4,500 b/cd; Cat hydrotreating: 17,100 b/cd.

Togo
5. Ste. Togolaise des Hydrocarbures, Lome, 20,000 b/cd.

Survey of operating refineries worldwide (capacities as of Jan. 1, 1989)

			Charge capacity, b/cd							Production capacity, b/cd				
Country	No. plants	Crude, b/cd	Vacuum distillation	Thermal operations	Catalytic cracking	Catalytic reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alkyla-tion	Aromatics-isomerization	Lubes	Asphalt	Hydrogen (MMcfd)	Coke (t/d)
Abu Dhabi	2	180,000	47,000	....	....	30,055	27,000	....	100,399	....	....	....	....	53.0	....
Algeria	4	464,700	15,000	....	....	55,600	....	....	23,600	....	1,900	2,400	5,300	....	....
Angola	1	32,100	1,900	....	....	1,900	....	2,800	3,800	....	....	....	950	....	....
Argentina	11	690,400	259,300	125,100	124,800	41,000	23,900	....	64,200	6,850	....	6,550	21,800	19.0	1,050
Australia	10	644,100	154,000	....	190,300	159,600	....	33,700	250,000	32,850	13,800	13,200	16,400	....	....
Austria	1	204,000	68,000	17,000	24,000	32,000	7,700	68,000	49,300	....	9,000	2,300	5,850	....	....
Bahrain	1	243,000	156,000	20,000	39,000	18,000	....	50,000	40,000	1,300	....	....	5,000	32.2	....
Bangladesh	1	31,200	3,530	....	....	1,650	....	2,430	1,940	....	....	....	1,200	....	....
Barbados	1	3,000	....	....	....	....	....	....	....	....	....	....	....	....	....
Belgium	4	630,500	298,000	62,800	102,000	80,300	....	190,100	182,700	7,710	....	....	25,300	46.0	....
Bolivia	3	57,500	2,961	....	....	14,900	....	....	15,379	....	....	377	....	....	....
Brazil	13	1,407,300	698,000	33,800	350,500	24,800	....	....	133,400	....	....	16,000	13,800	20.1	1,265
Brunei	1	10,000	....	....	....	....	....	....	....	....	....	....	....	....	....
Burma	2	26,300	4,800	1,700	....	....	....	....	....	....	....	....	....	....	40
Cameroon	1	42,000	....	....	....	7,000	....	10,500	9,500	....	....	....	....	....	....
Canada	27	1,865,800	657,850	88,250	387,600	369,600	206,350	51,000	771,600	71,145	55,870	17,360	112,050	309.2	756
Chile	3	146,800	74,800	20,000	36,670	10,000	....	....	6,000	1,000	....	....	1,070	....	....
China, Taiwan	2	570,000	117,325	13,500	22,500	56,250	18,000	167,400	....	3,150	43,200	....	....	100.0	800
Colombia	4	227,400	120,000	60,000	91,000	6,000	....	....	34,240	11,300	5,100	2,300	2,400	21.0	....
Congo	1	21,000	8,000	....	....	2,000	2,000	....	3,500	....	....	....	....	....	....
Costa Rica	1	16,200	600	6,500	....	1,200	....	....	3,400	....	....	....	300	....	....
Cyprus	1	17,100	2,600	....	....	4,250	....	....	7,750	....	....	....	1,200	....	....
Denmark	3	176,500	41,050	70,670	....	31,700	....	10,000	85,800	....	3,900	....	8,000	....	....
Dominican Republic	2	47,000	....	....	....	7,500	....	....	21,700	....	....	....	....	0.8	....
Ecuador	3	123,300	43,020	25,200	16,000	2,780	....	....	....	....	....	....	....	....	....
Egypt	8	469,203	46,725	16,470	....	30,940	....	....	84,386	804	1,452	3,846	6,633	5.5	541
El Salvador	1	17,000	1,900	....	....	3,800	....	....	12,100	....	....	....	....	....	....
Ethiopia	1	18,000	1,600	....	....	2,270	....	....	....	....	....	....	....	....	....
Finland	2	241,000	81,400	46,300	41,800	42,900	14,200	104,500	57,930	7,980	3,600	....	11,800	20.0	....
France	14	1,875,970	684,500	152,850	319,200	247,000	13,500	264,900	523,000	10,150	14,980	31,600	59,650	28.0	....
Gabon	1	24,000	....	7,200	....	1,400	....	....	3,600	....	....	....	....	....	....
Germany	15	1,518,200	608,700	289,500	179,400	275,100	96,200	296,400	624,200	11,300	62,290	9,000	75,840	156.5	2,860
Ghana	1	26,600	....	....	....	5,850	....	....	5,850	....	....	....	....	....	....
Greece	4	384,500	118,100	41,120	50,500	51,300	....	41,100	100,200	5,700	4,250	3,100	5,600	9.1	....
Guatemala	1	16,000	....	....	....	3,000	....	....	5,000	....	....	....	....	....	....
Honduras	1	14,000	....	....	....	1,800	....	....	5,000	....	....	....	....	....	....
Hungary	3	220,000	120,000	13,300	20,000	23,000	....	....	76,600	3,300	9,800	4,000	10,800	....	....
India	12	1,051,441	332,996	110,670	133,953	26,030	6,000	13,800	70,630	....	4,250	15,000	37,229	9.5	881
Indonesia	6	714,200	229,000	81,700	12,600	61,500	100,100	18,000	51,500	600	....	5,000	7,500	130.8	700
Iran	4	530,000	215,200	60,800	....	63,845	93,180	3,120	34,225	....	....	6,000	12,450	70.0	....
Iraq	8	318,500	62,650	....	....	43,500	38,000	100,000	13,000	....	....	10,168	6,715	64.0	....
Ireland	1	56,000	....	....	....	11,000	....	5,500	11,000	....	....	....	....	....	....
Israel	2	180,000	90,000	70,000	20,000	26,000	....	45,000	30,000	....	....	....	3,000	....	....
Italy	19	2,450,200	590,100	360,400	278,300	284,300	59,000	337,100	579,200	38,300	64,000	33,610	131,370	60.9	1,400
Ivory Coast	2	60,000	42,000	....	....	16,600	11,500	11,500	21,000	....	....	....	6,000	....	....
Jamaica	1	34,200	1,900	....	....	3,240	....	....	19,350	....	....	....	....	....	....
Japan	41	4,362,750	1,698,940	82,800	596,950	551,650	101,750	1,370,280	1,973,740	33,880	63,550	48,550	58,475	944.5	650
Jordan	1	100,000	16,900	....	4,410	8,640	4,800	....	17,100	....	....	....	....	7.9	....
Kenya	1	90,000	1,700	....	....	9,000	....	....	33,000	....	....	....	....	....	....
Korea	6	880,000	67,400	49,000	....	62,450	29,000	21,000	110,800	....	17,630	6,200	15,200	68.4	1,200
Kuwait	4	817,000	338,000	54,000	42,000	33,000	170,000	205,000	263,000	....	....	....	5,000	527.0	1,900
Lebanon	2	37,000	12,730	....	7,250	7,492	....	7,392	3,100	....	....	....	409	....	....

Survey of operating refineries worldwide (capacities as of Jan. 1, 1989)

Country	No. plants	Crude, b/cd	Charge capacity, b/cd							Production capacity, b/cd				Hydrogen (MMcfd)	Coke (t/d)
			Vacuum distillation	Thermal operations	Catalytic cracking	Catalytic reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alkylation	Aromatics-isomerization	Lubes	Asphalt		
Liberia	1	15,000	1,000	....	....	2,000	....	....	3,300	....	....	....	200	....	....
Libya	3	329,400	3,432	....	....	13,982	....	....	37,126	....	....	635	1,716	....	....
Madagascar	1	16,350	1,200	7,000	....	2,600	....	3,600	5,500	....	....	....	....	....	....
Malaysia	4	209,300	7,150	....	....	21,980	....	....	60,850	....	....	....	1,700	....	....
Martinique	1	12,800	....	....	....	7,410	....	....	8,350	....	....	....	....	....	....
Mexico	9	1,354,000	600,700	82,000	267,000	157,800	18,000	250,000	207,000	3,860	10,594	15,500	15,000	70.0	260
Morocco	2	154,600	27,400	....	5,600	26,800	....	....	38,600	....	....	2,100	13,700	....	....
Netherlands	7	1,380,700	399,370	154,360	125,500	166,400	30,000	148,200	522,620	11,500	....	11,700	14,320	86.0	....
Netherlands Antilles	1	320,000	158,000	67,000	42,000	15,000	....	....	121,500	5,600	....	8,000	8,000	....	....
New Zealand	1	88,400	36,600	....	....	21,900	21,500	6,500	47,400	....	....	....	2,300	44.0	....
Nicaragua	1	14,500	2,000	....	....	2,800	....	....	10,000	....	....	....	800	....	....
Nigeria	4	414,500	122,290	....	84,000	71,000	....	....	110,686	9,294	3,901	3,878	14,850	....	....
Norway	3	239,400	4,000	77,300	....	30,100	....	....	79,700	....	3,600	....	4,000	....	480
Oman	1	76,932	....	....	....	15,386	....	....	19,506	....	....	....	....	....	....
Pakistan	3	130,050	14,200	....	....	5,450	....	....	24,800	....	1,250	3,815	4,050	0.1	....
Panama	1	100,000	14,000	....	....	7,500	....	....	30,000	....	....	....	5,000	....	....
Paraguay	1	7,500	....	....	....	....	....	....	....	....	....	....	....	....	....
Peru	6	172,436	36,915	....	22,540	1,680	....	....	....	....	....	1,080	1,530	....	....
Philippines	4	254,000	58,600	....	23,100	39,400	....	23,000	91,200	....	....	3,400	5,000	....	....
Portugal	3	313,300	55,300	....	10,100	52,200	10,200	49,800	76,200	....	8,200	3,000	5,800	....	....
Puerto Rico	2	123,000	59,300	....	12,000	5,800	15,000	12,000	....	1,000	....	9,000	900	18.0	....
Qatar	1	62,000	....	....	....	12,030	....	....	39,640	....	....	....	....	....	....
Saudi Arabia	7	1,375,000	280,655	32,000	76,000	180,900	70,100	40,000	340,000	12,500	19,400	....	30,500	201.0	....
Senegal	1	29,800	18,800	....	....	2,870	....	....	....	....	....	....	....	....	....
Sierra Leone	1	10,000	....	....	....	....	....	....	....	....	....	....	....	....	....
Singapore	5	852,000	256,100	137,700	....	58,300	48,100	80,600	243,400	....	....	12,800	12,000	79.0	....
Somalia	1	10,000	....	....	....	....	....	....	....	....	....	....	....	....	....
South Africa	4	433,500	104,000	63,500	84,400	62,800	18,000	17,300	142,150	7,000	9,400	3,000	6,140	34.0	....
Spain	10	1,285,000	368,800	173,000	164,000	171,600	15,000	192,100	278,900	1,700	22,020	8,400	40,220	59.2	550
Sri Lanka	1	50,000	2,400	12,500	....	3,750	....	2,100	15,300	....	....	....	1,000	....	....
Sudan	1	21,440	....	....	....	1,700	....	....	7,400	....	....	....	....	....	....
Sweden	5	426,500	122,000	67,000	25,000	71,000	....	90,500	118,000	3,500	4,000	2,500	28,500	1.9	....
Switzerland	2	132,000	24,000	20,000	....	26,000	....	8,000	49,200	....	3,600	....	5,200	....	....
Syria	2	243,744	61,346	36,384	....	18,994	....	18,684	47,755	....	....	....	8,490	9.9	487
Tanzania	1	13,500	....	....	....	3,000	....	....	5,000	....	....	....	....	....	....
Thailand	3	191,045	22,800	16,920	8,100	26,280	....	17,550	69,000	....	....	....	1,100	4.7	....
Trinidad	2	370,000	171,000	18,000	28,000	31,000	....	104,500	41,800	2,650	2,600	2,700	2,000	....	....
Tunisia	1	34,000	....	....	....	3,300	....	....	....	....	....	....	....	....	....
Turkey	5	724,654	159,376	4,500	34,128	63,127	....	15,096	153,524	....	....	4,000	29,617	0.4	....
United Kingdom	15	1,803,100	806,840	152,000	442,000	307,500	21,000	115,600	776,590	66,700	70,650	21,600	39,800	78.2	2,150
Uruguay	1	33,000	13,000	....	4,100	2,500	....	....	3,700	....	....	....	....	....	....
Venezuela	6	1,201,100	560,600	138,000	193,100	6,000	....	296,100	....	61,250	18,300	7,590	39,800	108.9	100
Virgin Islands	1	545,000	215,000	80,000	....	125,000	....	130,000	290,000	....	45,000	....	....	....	....
Yemen, N.	1	10,000	....	....	....	2,500	....	....	....	....	....	....	....	....	....
Yemen, S.	1	161,500	9,500	....	....	10,800	....	2,700	....	....	....	....	2,000	....	....
Yugoslavia	7	609,135	178,759	35,630	52,050	74,612	7,200	21,970	107,878	3,400	18,450	4,900	27,325	14.9	137
Zaire	1	16,700	....	....	....	3,500	....	....	5,000	....	....	....	....	....	....
Zambia	1	20,594	2,170	....	....	5,070	....	....	8,250	....	....	....	....	....	....
Total	411	40,713,446	13,154,780	3,375,424	4,793,451	4,798,013	1,296,290	5,136,422	10,773,544	437,273	619,717	366,161	1,046,846	3,513.6	18,207

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd				Hydrogen, MMcfd	Coke, tons/day
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt		
ABU DHABI	Abu Dhabi National Oil Co.–Ruwais	120,000	47,000	....	....	[2]19,150	[1]27,000	....	[2]34,350 [4]42,630	....	....	....	....	[1]53.0	....
	Umm Al-Nar 2	60,000	....	....	....	[4]10,905	....	....	[2]17,530 [4]5,889	....	....	....	....	....	....
	Total	180,000	47,000	....	....	30,055	27,000	....	100,399	....	....	....	....	53.0	....
ALBANIA	Government-owned refineries at Ballsh, Cerrik, Stalin.														
	Total	40,000													
ALGERIA	Sonatrach: Arzew	60,000	6,000	....	....	8,600	....	....	8,600	....	....	2,400	2,400	....	....
	Hassi Messaoud	23,700	....	....	....	2,000	....	....	....	....	....	....	....	....	....
	Maison Carree	58,000	....	....	....	15,000	....	....	15,000	....	....	....	....	....	....
	Skikda	323,000	9,000	....	....	30,000	....	....	....	....	1,900	....	2,900	....	....
	Total	464,700	15,000	....	....	55,000	....	....	23,600	....	1,900	2,400	5,300	....	....
ANGOLA	Petrangol SARL–Luanda	32,100	1,900	....	....	[1]1,900	....	[4]2,800	[1-2]3,800	....	....	....	950	....	....
ARGENTINA	Destileria Argentina de Petróleo SA–Lomas de Zamora	2,000	1,500	....	....	....	....	....	....	....	....	....	....	....	....
	Esso SAPA–Campana	94,500	51,200	[5]22,400	[1]29,700	[2]8,500	....	....	[2]8,300 [5]8,700	....	....	1,000	....	....	1,050
	Galvan	18,600	....	[2]7,700	....	....	....	....	....	....	....	....	....	....	....
	Isaura SA–Bahia Blanca	12,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Shell Cia. Argentina de Petróleo SA–Buenos Aires	121,700	54,000	[2]27,000	[1]29,200	[1]12,000	....	....	[2]14,900 [4]7,500	[2]1,700 *500	....	1,400	4,200	....	....
	Yacimientos Petroliferos Fiscales–Campo Duran	32,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Dock Sud	4,000	1,000	....	....	....	....	....	....	....	....	....	....	....	....
	La Plata	216,000	69,500	[5]22,000	[1]45,000	[1]9,000	....	....	[1]9,000 [4]3,000 [6]5,900	[1]1,200 [2]750 *2,700	....	4,150	17,600	....	....
	Lujan de Cuyo	129,000	66,000	[5]30,000	[1]20,900	[1]9,000	[1]23,900	....	[1]4,400	....	...	....	....	[1]19.0	....
	Plaza Huincul	23,000	....	....	....	[2]2,500	....	....	[2]2,500	....	....	....	....	....	....
	San Lorenzo	37,600	16,100	[2]3,500 [3]12,500	....	....	....	....	....	....	....	....	....	....	....
	Total	690,400	259,300	125,100	124,800	41,000	23,900	....	64,200	6,850	....	6,550	21,800	19.0	1,050
AUSTRALIA	Ampol Refineries Ltd.–Lytton	72,000	....	...	[1]27,500	[1]13,000	....	....	[5]5,000	[1]4,000 *1,100	[6]5,800	....	....	....	....
	Australian Lubricating Oil Refinery Ltd.–Kurnell	....	6,900	....	....	....	....	....	[6]6,300	....	....	3,400	...	....	....
	BP Australia–Brisbane	42,000	11,400	....	[1]15,800	[2]8,500	....	....	[4]7,600	[2]1,850	....	....	1,500	....	....
	Kwinana	100,000	43,000	....	[1]24,000	[1]6,400 [2]16,400	....	[4]8,200	[1]12,000	[2]2,400	....	2,600	1,700	....	....
	Caltex Refining CPL–Kurnell[1]	100,000	20,000	....	[1]39,000	[1]25,600	....	....	[1]25,300 [4-6]14,000	[1]2,600 *2,700	....	....	3,000	....	....
	Mobil Oil Australia Ltd.–Adelaide	....	20,000	....	....	....	....	....	....	....	....	4,700	....	....	....

	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/Isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/day
	Petroleum Refineries Australia PL–Adelaide	46,500	....	....	....	[2]20,000	....	....	[7]42,500	....	....	....	1,200	....	....
	Altona	98,600	22,000	....	[2]24,000	[2]28,000	....	....	[1]35,000 [4]10,000	[1]2,700	..	....	3,000	....	....
	Shell Refining (Australia) PL.–Clyde	75,000	21,000	....	[1]35,000	[2]13,700	....	[2]7,000	[4]37,000	[2]5,000 *3,000	....	....	3,000	....	....
	Geelong	110,000	9,700	....	[1]25,000	[2]8,000 [6]20,000	....	[2]4,000 [3]11,000 [5]3,500	[4]55,000	[2]6,000 *1,500	[6]8,000	2,500	3,000	....	....
	Total	**644,100**	**154,000**	....	**190,300**	**159,600**	....	**33,700**	**250,000**	**32,850**	**13,000**	**13,200**	**16,400**	....	....
	Solvent extraction: [1]4,800 b/cd.														
AUSTRIA	OeMV–Schwechat	204,000	68,000	[3]17,000	[1]24,000	[2]14,000 [4]18,000	[1]7,700	[2]35,000 [4]33,000	[1]37,000 [6]1,300 [7]11,000	....	[6]9,000	2,300	5,850	....	....
	Total	**204,000**	**68,000**	**17,000**	**24,000**	**32,000**	**7,700**	**68,000**	**49,300**	....	**9,000**	**2,300**	**5,850**	....	....
BAHRAIN	Bahrain Petroleum Co. BSC (Closed)–Sitra	243,000	156,000	[3]20,000	[1]39,000	[2]18,000	....	[1]50,000	[1]18,000 [4]22,000	*1,300	....	..	5,000	[1]32.2	....
	Total	**243,000**	**156,000**	**20,000**	**39,000**	**18,000**	....	**50,000**	**40,000**	**1,300**	....	....	**5,000**	**32.2**	....
BANGLADESH	Eastern Refinery Ltd.–Chittagong	**31,200**	**3,530**	....	....	**[1]1,650**	....	**[4]2,430**	**[2]1,940**	....	....	....	**1,200**	....	....
BARBADOS	Mobil Oil Barbados Ltd.–Bridgetown	**3,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
BELGIUM	Belgian Refining Corp. NV–Antwerp	91,500	45,000	[3]20,300	....	[2]12,000	....	[1-2]22,500 [5]25,000	....	....	....	....	....	....	....
	Esso Inc.–Antwerp	218,000	108,300	....	[1]25,500	[4]38,100	....	79,200	[2]44,400 [4]71,200	....	....	....	2,000	[1]46.0	....
	Nynas Petroleum NV—Antwerp	15,000	12,500	....	....	....	....	....	....	....	....	....	12,000	....	....
	Fina Raffinaderij Antwerpen—Antwerp	306,000	132,200	[3]42,500	[1]76,500	[2]30,200	....	[3-4]63,400	[2]67,100	[2]6,150 *1,560	....	....	11,300	....	....
	Total	**630,500**	**298,000**	**62,800**	**102,000**	**80,300**	....	**190,100**	**182,700**	**7,710**	....	....	**25,300**	**46.0**	....
BOLIVIA	Yacimientos Petroliferos Fiscales Bolivianos–Cochabamba[1]	39,500	2,961	....	....	[1]8,500	....	....	[1]8,500 [6]479	....	....	377	....	....	....
	Santa Cruz	15,000	....	....	....	[2]6,400	....	....	[1]6,400	....	....	....	....	....	....
	Sucre	3,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**57,500**	**2,961**	....	....	**14,900**	....	....	**15,379**	....	....	**377**	....	....	....
	[1]Solvent extraction: 166 b/cd.														
BRAZIL	Petróleo Brasileiro SA: Araucária, Paraná	151,000	61,000	....	[1]47,200	....	....	....	....	....	....	....	....	....	....
	Betim, Minas Gerais	144,600	68,400	....	[1]34,100	....	....	....	[2]12,000 [5]30,000	....	....	....	....	[2]5.0	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd: Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd: Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	Canoas, Rio Grande do Sul	72,300	36,500	....	[1]15,100	....	....	....	....	....	....	....	....	....	....
	Cubatão, São Paulo	163,600	81,100	[5]25,100	[1]53,400	[1]11,000	....	....	....	....	....	....	8,800	....	1,265
	Duque de Caxias, Rio de Janeiro	226,600	112,500	....	[1]47,200	[1]13,800	....	....	....	....	....	12,500	....	[2]5.0	....
	Fortaleza, Ceará	....	4,700	....	....	....	....	....	....	....	....	....	2,500	....	....
	Manaus, Amazonas	10,000	5,600	....	[1]2,000	....	....	....	....	....	....	....	....	....	....
	Matarípe, Bahia	121,400	63,200	....	[1]27,700	....	....	....	[6]3,300 [7]2,000	....	....	3,500	2,500	[1]1.1	....
	Mauá, Santo André, São Paulo	32,500	10,000	....	[2]18,200	....	....	....	....	....	....	....	....	....	....
	Paulínia, São Paulo	302,000	150,000	....	[1]44,000	....	....	....	....	....	....	....	....	....	....
	São José dos Campos, São Paulo	164,000	100,000	....	[1]59,100	....	....	....	[2]20,100 [5]66,000	....	....	....	....	[2]9.0	....
	Refinaria de Petróleo Ipiranga SA–Rio Grande do Sul	9,300	5,000	....	[1]2,500	....	....	....	....	....	....	....	....	....	....
	Refinaría de Petroleos de Manguinhos SA–Rio de Janeiro	10,000	....	[2]4,300 [3]4,400	....	....	....	....	....	....	....	....	....	....	....
	Total	**1,407,300**	**[illegible]**	**33,800**	**350,500**	**24,800**	....	....	**133,400**	....	....	**16,000**	**13,800**	**20.1**	**1,265**
BRUNEI	Brunei Shell Petroleum CL–Seria	**10,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
BULGARIA	Government-owned refineries at Burgas, Pleven, Ruse.														
	Total	**300,000**													
BURMA	Petrochamical Industries Corp.–Chauk	6,300	2,500	....	....	....	....	....	....	....	....	....	....	....	....
	Syriam	20,000	2,300	[2]1,700	....	....	....	....	....	....	....	....	....	....	40
	Total	**26,300**	**4,800**	**1,700**	....	....	....	....	....	....	....	....	....	....	**40**
CAMEROON	Sonara–National Refining CL–Caps Limboh, Limbe	**42,000**	....	....	....	**[2]7,000**	....	**[2]10,500**	**[2]9,500**	....	....	....	....	....	....
CANADA **Alberta**	Husky Oil Operations Ltd.–Lloydminster	23,500	15,000	....	....	....	....	....	....	....	....	....	12,000	....	....
	Imperial Oil Ltd.–Edmonton	164,900	66,100	....	[1]47,000	[4]20,900	....	[4]15,000	[2]51,000	[2]12,200	[4]6,700	3,200	5,800	....	....
	Petro-Canada Products Inc.–Edmonton	115,500	27,000	[5]7,100	[1]36,000	[2]12,600	[4]18,200	....	[6]6,600 [7]46,600	[2]9,500	[4]3,000	....	....	[1]30.8	431
	Shell Canada Ltd.–Scotford	59,700	....	....	....	[6]21,500	[1]40,500	....	[2]21,550 [4]21,000	....	[1-2]5,300 [3]270	....	....	[1]62.0	....
	Turbo Resources Ltd.–Balzac	27,500	6,950	....	[1]8,800	[2]7,550	....	....	[2]7,550 [4]7,550 [7]15,300	*1,035	....	....	....	....	....
	Total	**391,100**	**115,050**	**7,100**	**91,800**	**62,550**	**58,700**	**15,000**	**177,150**	**22,735**	**15,270**	**3,200**	**17,800**	**92.8**	**431**
British Columbia	Chevron Canada Ltd.–North Burnaby	36,000	9,400	....	[1]10,500	[1]10,000	....	....	[1]10,000	[1]2,000 *600	....	....	2,500	....	....
	Husky Oil Operations Ltd.–Prince George	9,500	3,800	....	[1]3,300	[2]1,400	....	....	[7]6,900	....	....	....	1,300	....	....
	Imperial Oil Ltd.–Ioco	42,800	20,900	....	[1]12,300	[3]6,700	....	....	[2]6,700 [4]5,700 [5]5,700	*1,200	....	....	700	....	....
	Petro-Canada Products Inc.–Port Moody	37,200	11,200	....	....	[2]8,600	....	....	[1]15,400 [4]9,400	....	....	....	....	....	....

			Charge capacity, b/cd							Production capacity, b/cd					
	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	Taylor	17,400	1,600	....	[1]6,300	[2]3,000	....	....	[1]4,000 [4]7,200	[2]1,000	....	....	500	....	....
	Shell Canada Ltd.–Shellburn, Burnaby	24,000	6,650	....	[1]5,400	[2]3,600	....	....	[2]5,400 [4]9,900	*720	...	....	2,250	....	....
	Total	166,900	53,560	....	37,800	33,300	....	....	86,300	5,520	....	....	7,250	....	....
New Brunswick	Irving Oil Ltd.–St. John	237,500	61,750	[3]18,000	[1]17,100	[2]34,650	[1]29,700	....	[1]45,450 [4]40,500	*1,710	[6]9,500	....	11,700	[2]40.0	....
	Total	237,500	61,750	18,000	17,100	34,650	29,700	....	85,950	1,710	9,500	....	11,700	40.0	....
Newfoundland	Newfoundland Processing Ltd.– Come By Chance	105,000	50,000	....	....	[2]26,000	[1]35,000	....	[2]26,000 [5]18,000	....	....	....	....	....	....
	Total	105,000	50,000	....	....	26,000	35,000	....	44,000	....	....	....	....	....	....
Northwest Territories	Imperial Oil Ltd.–Norman Wells	3,500	....	....	....	....	....	....	....	....	....	....	....	....	....
Nova Scotia	Imperial Oil Ltd.–Dartmouth	82,300	39,800	....	[1]23,000	[4]8,600	....	....	[1]8,600 [4]25,700 [5]8,600	*2,600	...	....	4,200	[1]1.7	....
	Texaco Canada Ltd.–Halifax	20,000	8,600	....	[1]7,200	[2]3,600	....	[4]5,200	[1]3,600	....	....	....	....	....	....
	Total	102,300	48,400	....	30,200	12,200	....	5,200	46,500	2,600	....	....	4,200	1.7	....
Ontario	Imperial Oil Ltd.–Sarnia	122,600	28,500	[4]21,000	[1]23,500	[2]13,300 [4]14,300	[1]10,400	....	[2]32,300 [4]13,300 [5]24,700	[2]6,800 *4,200	....	6,200	....	[1]21.8	....
	Petro-Canada Products Inc.–Clarkson	41,500	35,500	....	....	[6]9,800	[3]10,300	....	[1]10,300 [4]7,800	....	....	4,900	4,600	[1]13.3	....
	Oakville	80,500	41,000	....	[1]25,400	[1]5,000 [2]11,500	....	....	[1]19,500 [4]6,300	[1]3,100	....	....	9,500	....	....
	Shell Canada Ltd.–Sarnia	71,000	24,700	[3]4,050	[1]14,400	[2]21,000	[1]6,750	....	[1]15,000 [5]6,300	*1,600	[1]2,700	....	....	....	....
	Suncor Inc.–Sarnia	70,000	15,000	[3]5,200	[2]16,000	[2]26,000	[2]18,600	[4]3,700	[1]25,600	[2]4,100	[1]7,400	....	....	[1]38.0	....
	Texaco Canada Ltd.–Nanticoke	95,000	31,000	....	[1]40,000	[6]24,000	....	....	[1]24,000	[1]7,400	....	....	....	....	....
	Total	480,600	175,700	30,250	119,300	124,900	46,050	3,700	185,100	27,200	10,100	11,100	14,100	73.1	....
Quebec	Petro-Canada Products Inc.–Montreal	87,400	40,700	[3]12,600	[1]17,200	[2]31,300	[4]14,400	....	[1]26,600 [4]9,000	[1]2,300 *800	[1]8,700 [2]2,800	....	14,300	[1]42.8	....
	Shell Canada Ltd.–Montreal	120,000	49,400	[3]12,000	[1]22,000	[2]20,700	[1]11,700	....	[2]34,200 [4]27,000	[2]2,500	[6]6,800	3,060	7,200	....	....
	Ultramar Canada Inc.–St. Romuald	103,000	33,000	....	[1]34,600	[2]15,000	....	....	[1]15,000 [4]15,000	*3,900	....	....	30,000	....	....
	Total	310,400	123,100	24,600	73,800	67,000	26,100	....	126,800	9,500	18,300	3,060	51,500	42.8	....
Saskatchewan	Consumers' Cooperative Refineries Ltd.–Regina	45,200	23,000	[5]8,300	[1]17,600	[2]9,000	[1]10,800	[1]27,100	[1]10,800 [2]2,700 [5]6,300	*1,880	[6]2,700	....	....	[1]58.8	325

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd				Hydrogen, MMcfd	Coke, tons/day
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/isomerization	Lubes	Asphalt		
	Petro-Canada Products Inc.–Moose Jaw	13,300	7,300	....	....	....	....	....	....	....	....	....	5,500	....	....
	Total	58,000	38,300	8,300	17,000	9,000	18,000	27,100	19,000	1,800	2,700	....	5,500	58.8	325
	Total Canada	1,886,000	667,000	88,250	387,000	380,600	296,350	51,000	771,000	71,145	58,870	17,360	112,850	309.2	758
CHILE	ENAP–Gregorio-Magallanes	8,800	....	....	....	....	....	....	....	....	....	....	....	....	....
	Petrox SA–Talcahuano	72,000	35,800	^{3}10,000	^{1}16,670	^{2}4,000	....	....	....	....	....	....	70	....	....
	Refinería de Concón–Concón	66,000	39,000	^{3}10,000	^{1}20,000	^{1}6,000	....	....	^{3}6,000	^{1}1,000	....	....	1,000	....	....
	Total	146,800	74,800	20,000	36,670	10,000	....	....	6,000	1,000	....	....	1,070	....	....
CHINA	Government-owned refineries at Anshan, Beijing, Dalian, Daqing, Fushun, Hangzhou, Jinxi, Karamai-Dushanzi, Lanchow, Lenghu, Maoming, Nanchong, Nanjing, Shanghai, Shengli, Tianjin, Yumen.														
	Total	2,200,000													
CHINA, TAIWAN	Chinese Petroleum Corp.–Kaohsiung	446,500	83,125	^{5}13,500	^{1}22,500	^{2}36,000	^{1}18,000	^{1}27,000 ^{2}40,500 ^{4}40,500	....	^{2}3,150	^{3}29,700 ^{6}13,500	....	....	^{2}50.0	800
	Tao-Yuan	123,500	34,200	....	....	^{2}20,250	....	^{1}27,000 ^{2}18,000 ^{4}14,400	....	....	....	....	....	^{1}50.0	....
	Total	570,000	117,325	13,500	22,500	56,250	18,000	167,400	....	3,150	43,200	....	....	100.0	800
COLOMBIA	Empresa Colombiana de Petróleos –Barrancabermeja-Santander[1]	150,000	80,000	^{3}40,000	^{1}62,000	^{2}6,000	....	....	^{1}6,000 ^{3}540 ^{5}22,000 ^{6}4,300 ^{7}1,400	^{1}3,000 ^{2}500 *2,000	^{1}3,300 ^{2}1,100 ^{3}700	2,300	2,400	^{1}21.0	....
	Cartagena, Bolivar	70,000	40,000	^{3}20,000	^{1}29,000	....	....	....	....	*5,800	....	....	....	....	....
	Orito, Putumayo	2,400	....	....	....	....	....	....	....	....	....	....	....	....	....
	Tibu, N. de Santander	5,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	227,400	120,000	60,000	91,000	6,000	....	....	34,240	11,300	5,100	2,300	2,400	21.0	....
	Solvent extraction: ^{1}35,000 b/cd.														
CONGO	Coraf–Pointe-Noire	21,000	8,000	....	....	^{2}2,000	^{1}2,000	....	^{4}3,500	....	....	....	....	....	....
COSTA RICA	Refinadora Costarricense de Petroleo SA–Limón	16,200	600	^{3}6,500	....	^{2}1,200	....	....	^{1}1,200 ^{4}2,200	....	....	....	300	....	....
	Total	16,200	600	6,500	....	1,200	....	....	3,400	....	....	....	300	....	....
CUBA	Government-owned refineries at Cabaiguan, Havana, Santiago de Cuba.														
	Total	100,000													
CYPRUS	Cyprus Petroleum Refinery Ltd.–Larnaca	17,100	2,000	....	....	^{2}4,250	....	....	^{4}7,750	....	....	....	1,200	....	....
CZECHO-SLOVAKIA	Government owned refineries at Bratislava, Kolin, Kralupi, Pardubice, Strazke, Zaluzi, Zyolen.														
	Total	455,000													

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/day
DENMARK	AS Dansk Shell–Fredericia	55,000	....	[2]22,000	....	[2]12,000	....	[2]10,000	[2]20,000	....	[6]3,900	....	....	....	....
	Statoil AS–Kalundborg	65,000	22,000	[3]28,000	....	[2]9,200	....	....	[1]9,200 [5]11,400	....	....	....	8,000	....	....
	Kuwait Petroleum Refining (Danmark) A/S–Gulfhavn	56,500	19,050	[2]10,900 [3]9,770	....	[2]10,500	....	....	[2]22,300 [4-5]22,900	....	....	....	....	....	....
	Total	**176,500**	**41,050**	**70,670**	....	**31,700**	....	**10,000**	**85,800**	....	**3,900**	....	**8,000**	....	....
DOMINICAN REPUBLIC	Falconbridge Dominicana C por A–La Peguera	16,000	....	....	....	....	....	....	[2]6,200	....	....	....	....	[2]0.8	....
	Refineria Dominicana de Petróleo SA–Haina	31,000	....	....	....	[1]7,500	....	....	[4]15,500	....	....	....	....	....	....
	Total	**47,000**	....	....	....	**7,500**	....	....	**21,700**	....	....	....	....	**0.8**	....
ECUADOR	CEPE–Esmeraldas	90,000	43,020	[3]25,200	[1]16,000	[2]2,780	....	....	....	....	....	....	....	....	....
	Anglo Ecuadorian Oilfields Ltd.–Sta. Elena Peninsula	32,300	....	....	....	....	....	....	....	....	....	....	....	....	....
	Texaco–Lago-Agrio	1,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**123,300**	**43,020**	**25,200**	**16,000**	**2,780**	....	....	....	....	....	....	....	....	....
EGYPT	Alexandria Petroleum Co.–Alexandria (El-Mex)	99,250	22,500	....	....	....	....	....	[6]1,436 [7]76	....	603 281	1,436	2,010	[1]1.0	1
	Cairo Oil Refining Co.–Mostorod	125,060	....	....	....	[2]9,000	....	....	[1]11,700 [4]14,400	....	....	....	....	....	....
	Tanta	21,800	....	....	....	....	....	....	....	....	....	....	....	....	....
	El Amaria Oil Refining Co.–Alexandria	60,340	14,725	....	....	[2]9,400	....	....	[1]12,000 [4]14,400 [6]1,608	[2]804	[1]86 [1]482	1,407	2,010	[1]1.0	....
	El-Nasr Petroleum Co.–El-Suez	58,400	....	....	....	....	....	....	....	....	....	....	2,613	....	....
	Wadi-Feran	9,680	....	....	....	....	....	....	....	....	....	....	....	....	....
	Suez Oil Processing Co.–El-Suez	62,530	9,500	[5]16,470	....	[2]12,540	....	....	[1]16,660 [4]10,800 [6]1,306	....	....	1,005	....	[5]3.5	540
	Assiout	52,143	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**489,203**	**46,725**	**16,470**	....	**30,940**	....	....	**84,386**	**804**	**1,452**	**3,848**	**6,633**	**5.5**	**541**
El SALVADOR	Refinería Petrólera Acajutla SA–Acajutla	17,000	1,200	....	[1]3,200	....	....	....	[2]5,000 [4]7,000	....	....	....	....	....	....
	Total	**17,000**	**1,200**	....	**3,200**	....	....	....	**12,000**	....	....	....	....	....	....
ETHIOPIA	Ethiopian Petroleum Corp.–Assab	**18,000**	**1,900**	....	....	[2]2,270	....	....	....	....	....	....	....	....	....
FINLAND	Neste Oy–Naantali	44,000	13,700	[3]7,100	[2]13,300	[5]6,800	....	[3]7,100 [4]14,700	[2]6,600 [7]330	*280	....	....	3,000	....	....
	Porvoo	197,000	67,700	[3]39,200	[1]28,500	[5]36,100	[1]14,200	[4]82,700	[2]51,000	[2]4,200 *3,500	[5]3,600	....	8,800	[1]20.0	....
	Total	**241,000**	**81,400**	**46,300**	**41,800**	**42,900**	**14,200**	**104,500**	**57,930**	**7,980**	**3,600**	....	**11,800**	**20.0**	....

			Charge capacity, b/cd							Production capacity, b/cd					
	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
FRANCE	CRD—Total France–Gonfreville L'Orcher[1]	309,000	73,000	[3]16,600	[1]31,500	[2]45,400	....	[3]59,600 [5]9,000	[1]27,100 [2]71,600	*1,150	[1]1,360	7,400	20,250		
	La Mède	136,000	47,500	[3]20,850	[1]29,700	[4]23,400	....	[3]49,100 [5]10,400	....	[2]2,400	....	....	16,200	....	....
	Mardyck	122,000	41,600	....	[1]29,800	[4]20,500	....	[3]24,500	[2]37,500	....	....	....	....	....	....
	Cie. Rhénane de Raffinage–Reichstett-Vendenheim	85,000	36,000	[2]5,000 [3]11,000	[1]14,000	[2]13,000	....	[2]12,000	[2]21,000	....	....	....	4,500	....	....
	Elf France–Donges	200,000	99,000	[3]30,200	[1]44,000	[2]25,400	....	....	[1]35,600 [4-5]38,000	[2]3,700	[6]4,300	....	....	....	....
	Feyzin	175,070	34,000	....	[1]21,400	[2]8,400	....	....	[1]8,700 [4-5]28,900	....	[1]5,000	....	....	....	
	Grandpuits	92,000	46,900	[3]13,400	[1]28,800	[2]12,900	....	....	[1]23,500 [4-5]26,100	[2]2,900	....	....	....	....	....
	Esso SAF–Fos sur Mer	100,000	23,000	....	[1]17,000	[1]16,000	....	....	[4]48,000	....	....	7,000	....	....	....
	Port Jerome	136,000	56,000	....	[1]20,000	[1]16,000	....	....	[4]36,000	....	....	....	....	....	....
	Mobil Oil Francaise–Notre Dame de Gravenchon	57,000	36,500	....	....	[2]13,300	....	....	[1]13,000 [4]13,000	....	....	5,500	1,500	....	....
	Shell Francaise–Berre l'Etang	128,000	60,000	[3]23,000	[1]38,000	[2]19,000	....	[2]35,000	[2]33,000	....	....	....	5,500	....	....
	Petit Couronne	154,000	113,000	[3]10,000	[1]19,000	[2]28,000	....	[2]33,000	[2]48,000	....	....	7,500	9,000	....	....
	Ste. Francaise des Petroles BP–Dunkirk	....	18,000	....	....	....	....	....	....	....	....	4,200	....	....	....
	Lavera	181,900	....	[3]22,800	[1]26,000	[1]5,700	[1]13,500	[4]32,300	[5]14,000	....	[1]4,300	....	2,700	[1]28.0	....
	Total	**1,875,970**	**684,500**	**152,850**	**319,200**	**247,000**	**13,500**	**264,900**	**523,000**	**10,150**	**14,960**	**31,600**	**59,650**	**28.0**	....
GABON	Ste. Gabonaise de Raffinage–Port Gentil	**24,000**	....	**[2]7,200**	....	**[3]1,400**	....	....	**[4]3,600**	....	....	....	....	....	...
GERMANY, E.	Government-owned	**470,000**													
GERMANY, WEST	Deutsche BP-Erdol Ingolstadt–Vohburg†	102,000	35,300	....	[1]17,200	[1]17,200	....	[4]14,000	[4]28,000	....	....	....	5,500	....	....
	Deutsche Marathon Petroleum GmbH–Burghausen	70,000	....	[6]26,000	....	....	....	....	[5]18,000	....	[1]2,200	....	....	....	....
	Deutsche Shell AG–Godorf	170,000	73,000	[2]29,000 [3]7,000	....	[2]17,000 [6]21,000	[1]19,000	[2]32,000	[2]52,000 [3]34,000 [4]12,000	....	[1]14,000 [2]3,000 [6]6,000	...	12,000	....	....
	Harburg-Grasbrook	86,000	45,000	[3]14,000	[1]15,000	[6]16,000	....	[2]14,000 [5]6,000	[2]31,000 [3]2,000	....	....	6,100	7,000	....	....
	Deutsche Texaco AG–Heide	80,000	34,000	[3]16,000	[2]9,000	[6]18,000	....	[4]29,000	[1]26,000	*300	[1]7,000	....	3,500	....	....
	Erdoel Raffinerie Neustadt GmbH–Neustadt-Donau	144,000	65,400	[3]15,300	[1]22,700	[1]17,700	....	[4]27,200	[1]22,500	....	....	....	5,400	....	....
	Esso AG–Ingolstadt	95,000	31,400	....	[1]24,500	[2]12,800	....	....	[2]20,400	....	....	....	7,400	....	....
	Karlsruhe	150,000	46,700	[2]28,000 [3]23,000 [5]17,000 [6]1,900	....	[2]27,900	....	....	[4]47,400 [2]43,000 [5]73,000	....	....	....	10,000	....	1,240
	Mobil Oil AG–Worth	93,000	23,000	....	[1]19,000	[2]15,900	....	....	[1]28,000 [5]26,000	....	....	....	5,000	....	....

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[1]Solvent extraction: 9,800 b/cd.

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/day
	Oberrheinische Mineralolwerke GmbH–Karlsruhe	142,000	102,000	[3]26,000	[1]66,000	[2]11,400 [6]20,100	....	[3]45,900 [4]28,000	[1]37,400	[2]8,500	....	....	11,800	....	....
	Ruhr Oel GmbH–Gelsenkirchen	215,400	48,200	[3]16,000 [5]28,000	[1]6,000	[1]11,900 [5]27,000	[1]30,000	[4]63,000	[1]53,000	....	[1]10,620 [2]2,150 [3]2,420	....	4,840	[5]25.0	1,200
	Union Rheinische Braunkohlen Kraftstoff AG–Wesseling	103,000	71,000	[3]27,000	....	[4]14,000	[1]28,000	[4]16,000	[1]14,000 [2]16,000 [3]15,000	*2,500	[1]6,000	....	....	[1]32.0 [3]42.0 [4]17.0	....
	Wintershall AG–Lingen	65,000	28,900	[5]15,300	....	[2]12,200 [4]15,000	[1]19,200	[4]21,300	[1]15,000 [2]2,500	....	[1]500 [2]900 [3]2,200	....	3,400	[1]40.0	420
	Mannheim	....	....	....	....	....	....	....	[3]5,500	....	[1]2,650 [2]2,650	....	....	....	....
	Salzbergen	2,800	4,800	....	....	....	....	....	[6]2,500	....	....	2,900	....	[1]0.5	....
	Total	**1,518,200**	**608,700**	**289,500**	**179,400**	**275,100**	**96,200**	**296,400**	**624,200**	**11,300**	**62,290**	**9,000**	**75,840**	**156.5**	**2,860**
GHANA	Ghanaian Italian Petroleum CL–Tema	**26,600**	....	....	....	**[2]5,850**	....	....	**[1]5,850**	....	....	....	....	....	....
GREECE	Hellenic Aspropyrgos Refinery SA–Aspropyrgos	110,000	51,000	[3]21,600	[1]23,300	[2]14,700 [6]20,000	....	[2]15,600 [3]25,500	[2]24,200	*1,300	....	....	....	[5]9.1	....
	Motor Oil (Hellas) Corinth Refineries SA–Aghii Theodori	100,000	59,000	[3]19,520	[1]27,200	[1]8,500	....	....	[1]11,800 [5]25,800 [6]3,100	[2]2,400 *2,000	[6]4,250	3,100	2,800	....	....
	Petrola Hellas SA–Elefsis	108,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Thessaloniki Refining Co. AE–Thessaloniki	66,500	8,100	....	....	[2]8,100	....	....	[2]16,500 [4]18,800	....	....	....	2,800	....	....
	Total	**384,500**	**118,100**	**41,120**	**50,500**	**51,300**	**....**	**41,100**	**100,200**	**5,700**	**4,250**	**3,100**	**5,600**	**9.1**	**....**
GUATEMALA	Texas Petroleum Co.–Escuintla	16,000	....	....	....	[2]3,000	....	....	[1]3,000 [4]2,000	....	....	....	....	....	....
	Total	**16,000**	**....**	**....**	**....**	**3,000**	**....**	**....**	**5,000**	**....**	**....**	**....**	**....**	**....**	**....**
HONDURAS	Refinería Texas de Honduras SA–Puerto Cortes	14,000	....	....	....	[1]1,800	....	....	[1]3,000 [4]2,000	....	....	....	....	....	....
	Total	**14,000**	**....**	**....**	**....**	**1,800**	**....**	**....**	**5,000**	**....**	**....**	**....**	**....**	**....**	**....**
HUNGARY	Dunai KV–Százhalombatta	150,000	84,000	[3]13,300	[1]20,000	[2]23,000	....	....	[1]23,000 [4]35,000 [6]2,200	[2]3,300	[1]7,100 [6]2,700	4,000	6,300	....	....
	Tiszai KV–Leninváros	60,000	30,000	....	....	....	....	....	[4]16,400	....	....	....	....	....	....
	Zalai KV–Zalaegerszeg	10,000	6,000	....	....	....	....	....	....	....	....	....	4,500	....	....
	Total	**220,000**	**120,000**	**13,300**	**20,000**	**23,000**	**....**	**....**	**76,600**	**3,300**	**9,800**	**4,000**	**10,800**	**....**	**....**

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†Operating on a semi-integrated basis.

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
INDIA	Bharat Petroleum CL–Mahul, Bombay	140,000	42,500	....	[1]31,000	[1]5,200	....	....	....	....	[1]2,500 [1]375	....	1,000	....	....
	Bongaigaon Refinery & Petrochemicals Ltd.–Bongaigaon, Assam	27,392	....	[5]10,400	....	[2]1,930	....	....	[1]1,930	....	....	....	....	....	166
	Cochin Refineries Ltd.–Kerala	90,000	34,200	[3]19,600	[1]20,000	[1]5,000	....	....	[2]9,400 [7]18,000	....	....	....	6,900	....	....
	Hindustan Petroleum CL–Mahul, Bombay[1]	110,000	50,000	...	[1]12,000	....	[3]6,000	....	[6]6,000	....	....	6,000	6,031	....	....
	Visakhapatnam	92,699	44,496	....	[1]19,583	....	....	....	....	....	....	....	2,585	....	....
	Indian Oil CL–Barauni	66,000	15,000	[5]20,170	....	....	....	....	....	....	....	....	....	....	525
	Digboi	10,050	....	[5]800	....	....	....	....	....	....	....	1,200	513	....	40
	Gauhati	60,400	....	[5]5,500	....	....	....	....	....	....	....	....	....	....	150
	Gujarat	165,200	47,000	[3]18,900	[1]19,800	[3]7,000	....	....	....	....	[1]1,375	....	4,300	....	....
	Haldia	55,000	20,000	[3]8,500	....	[3]4,500	....	[4]13,800	[6]3,800	....	....	3,800	3,500	....	....
	Mathura	120,000	43,000	[3]18,900	[1]19,800	....	....	....	....	....	....	....	8,600	....	....
	Madras Refineries Ltd.–Madras	114,700	36,800	[2]4,900 [3]3,000	[1]11,770	[1]2,400	....	....	[1]2,400 [4]25,100 [6]4,000	....	....	4,000	3,800	[1]9.5	....
	Total	**1,051,441**	**332,996**	**110,670**	**133,953**	**26,030**	**6,000**	**13,800**	**70,630**	....	**4,250**	**15,000**	**37,229**	**9.5**	**881**
INDONESIA	Pertamina–Balikpapan, Kalimantan	221,500	84,800	....	....	[6]18,000	[1]49,700	....	[1]18,000	....	....	....	....	[1]60.0	....
	Cilacap, Central Java	271,200	30,700	[3]49,900	....	[1]12,000 [6]18,000	....	[4]18,000	[1]18,100	....	....	5,000	7,500	....	....
	Dumai, Central Sumatra	99,400	83,500	[5]31,800	....	[1]5,600 [6]7,900	[1]50,400	....	[1]6,300 [3]9,100	....	....	....	....	[1]70.8	700
	Musi, South Sumatra	81,400	30,000	....	[1]12,600	....	....	....	....	[1]300 *300	....	....	....	....	....
	Pangakalan Brandan, North Sumatra	4,500	....	....	....	....	....	....	....	....	....	....	....	....	....
	Sungai Pakning, Central Sumatra	36,200	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**714,200**	**229,000**	**81,700**	**12,600**	**61,500**	**100,100**	**18,000**	**51,500**	**600**	....	**5,000**	**7,500**	**130.8**	**700**
IRAN	National Iranian Oil Co.–Esfahan	200,000	96,800	[3]38,000	....	29,600	[1]30,000	....	29,000	....	....	....	5,450	70.0	....
	Shiraz	40,000	18,400	[3]8,800	....	6,245	[1]9,380	3,120	5,225	....	....	....	....	....	....
	Tabriz	80,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Tehran	210,000	100,000	[3]34,000	....	28,000	[1]26,000 [2]27,800	....	....	....	....	6,000	7,000	....	....
	Total	**530,000**	**215,200**	**80,800**	....	**63,845**	**93,180**	**3,120**	**34,225**	....	....	**6,000**	**12,450**	**70.0**	....
IRAQ	Oil Refineries Administration–Baiji	150,000	65,000	....	....	22,000 16,500	38,000	31,000 28,000 41,000	....	....	....	....	....	64.0	....
	Basra	70,000	17,650	....	....	....	....	....	....	....	....	2,008	....	....	....
	Daura	71,000	....	....	....	5,000	....	....	13,000	....	....	8,160	1,815	....	....
	K3-Haditha	7,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Khanaqin	12,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Mufthia	4,500	....	....	....	....	....	....	....	....	....	....	....	....	....
	Qaiyarah, Mosul	2,000	....	....	....	....	....	....	....	....	....	....	4,900	....	....

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[1] Solvent extraction: 10,000 b/cd.

Note: Present status uncertain due to Iran-Iraq war.

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd — Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd — Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	Iraqi Company for Oil Operations–Kirkuk	2,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Total	**318,500**	**82,650**	....	....	**43,500**	**38,000**	**100,000**	**13,000**	....	....	**10,168**	**6,715**	**64.0**	....
	Note: Present status uncertain due to Iran-Iraq war.														
IRELAND	Irish Refining plc–Whitegate	**56,000**	....	....	....	[4]11,000	....	[4]5,500	[2]11,000	....	....	....	....	....	....
ISRAEL	Oil Refineries Ltd.–Ashdod	70,000	35,000	[3]25,000	....	[2]10,000	....	[4]25,000	[1]15,000	....	....	....	....	....	....
	Haifa	110,000	55,000	[3]45,000	[1]22,000	[2]16,000	....	[4]20,000	[1]15,000	....	....	....	3,000	....	....
	Total	**180,000**	**90,000**	**70,000**	**22,000**	**26,000**	....	**45,000**	**30,000**	....	....	....	**3,000**	....	....
ITALY	Agip Plus SpA–Livorno	100,000	36,000	....	....	[2]9,500 [4]9,000	....	[4]31,700	[1]20,000	....	....	8,800	3,500	....	....
	Agip Raffinazione–Rho, Milan	79,800	32,800	....	[2]14,300	[2]17,000	....	[4]15,400	[2]20,700	[2]1,600	....	1,410	4,100	[5]14.3	....
	Sannazzaro, Pavia	210,000	....	....	[1]27,000	[2]10,000 [5]16,700	....	[4]41,000	[1]9,800 [2]27,000	[2]3,200	[6]9,100	....	....	[5]2.8	....
	Taranto	83,300	13,500	[2]18,150 [3]37,250	....	[2]17,000	....	[4]13,700 [5]20,500	[2]24,000	....	....	....	....	[2]10.0	....
	Venezia	90,000	38,000	[3]25,000	....	[2]16,000	....	[4]18,000	[1]16,000 [2]5,200 [3]4,000	....	[5]5,200	....	6,500	....	....
	Anonima Petroli Italiana–Falconara, Marittima	78,900	13,000	[2]4,500 [3]31,000	....	[2]10,500	....	....	[1]18,900 [4]26,900	....	....	....	....	[5]3.8	....
	Arcola Petrolifera SpA–La Spezia	18,000	8,080	....	....	....	....	....	....	....	....	....	....	....	....
	Esso Italiana SpA–Augusta, Siracusa	180,000	94,000	....	[1]45,300	[2]9,300 [4]7,300	....	....	[1]16,600 [4]37,600 [6]23,000	[2]9,100	[4]5,300	16,900	11,500	....	....
	Industrie Chimiche Italiane de Petrolio SpA–Frassino, Mantova	55,000	19,600	[2]8,000 [3]19,000	....	[2]7,000	....	....	[2]14,000 [4]15,000	....	[6]2,500	....	3,000	....	....
	Iplom SpA–Busalla	46,500	12,600	[3]13,100	....	....	....	....	....	....	....	6,500	12,500	....	....
	Isab–Priolo Gargallo	220,000	110,000	[2]15,000 [3]39,000	....	[4]34,500	[1]59,000	[4]86,000	[2]59,000	....	[6]15,000	....	....	[1]18.0	....
	Mobil Oil Italiana SpA–Naples	100,000	22,500	7,500	[2]18,400	[2]12,500	....	....	[1]12,500 [5]12,000	[2]3,500	....	....	650	....	....
	Raffineria di Roma SpA–Rome	80,500	11,300	[3]28,400	....	[2]14,200	....	[2]17,000	[2]19,900	....	[4]5,200	....	9,620	....	....
	Raffineria Mediterranea SrL–Milazzo	160,000	72,000	....	[1]28,000	[2]11,000	....	....	[1]10,000	[1]3,600	....	....	....	....	....
	Raffineria Siciliana Srl–Gela	80,000	32,000	[4]29,500	[1]34,000	[2]10,000	....	[4]25,000	[2]7,000	[2]9,000	[2]800 [4]4,000	....	....	....	1,400
	Saras SpA–Sarroch	285,000	....	[3]27,000	[1]63,000	[5]27,000	....	....	[1]27,000 [4]60,000	[2]6,800	....	....	....	[5]12.0	....
	Sarpom–Trecate, Novara	248,200	24,800	....	[1]16,300	[2]18,500 [4]8,100	....	[4]38,000	[2]69,700	1,500	....	....	80,000	....	....
	Selm-Soc. Energia Montedison–Priolo	240,000	50,000	[3]25,000	[1]32,000	[2]9,000	....	[4]18,000	[1]9,000	....	[1]12,000 [2]1,300	....	....	....	....
	Tamoil Italia SpA–Cremona	95,000	....	[3]33,000	....	[1]3,800 [2]6,400	....	[4]12,800	[2]14,400	....	[6]3,600	....	....	....	....
	Total	**2,450,200**	**590,100**	**360,400**	**278,300**	**284,300**	**59,000**	**337,100**	**579,200**	**38,300**	**64,000**	**33,610**	**131,370**	**60.9**	**1,400**
IVORY COAST	Ste. Ivoirienne de Raffinage—Abidjan	50,000	34,500	....	....	[2]16,600	[1]11,500	11,500	[4]21,000	....	....	....	....	....	....
	Ste. Multinationale de Bitumes—Abidjan	10,000	7,500	....	....	....	....	....	....	....	....	....	6,000	....	....
	Total	**50,000**	**42,000**	....	....	**16,600**	**11,500**	**11,500**	**21,000**		....	....	**6,000**	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
JAMAICA	Petrojam Ltd.–Kingston	34,200	1,900	....	....	^{1}3,240	....	....	$^{1\cdot2}$5,850 ^{4}13,500	....	....	....	....	....	....
	Total	**34,200**	**1,900**	....	....	**3,240**	....	....	**19,350**	....	....	....	....	....	....
JAPAN	Asia Oil CL–Sakaide, Kagawa	13,500	36,000	....	^{1}13,500	^{2}9,000	....	^{1}25,200 ^{2}48,780 ^{4}17,100	^{1}9,000 ^{2}3,600	....	....	....	....	^{5}32.0	....
	Cosmo Oil CL–Chiba	209,000	57,000	....	^{1}26,600	^{2}31,800	....	^{1}57,000 ^{2}33,200	^{1}31,800 ^{2}7,600 ^{4}60,800	....	....	....	....	^{1}21.0 ^{2}62.0	....
	Sakai	104,500	32,300	....	^{1}17,550	^{2}6,650	....	^{2}18,000	^{1}7,650 ^{4}21,900	....	....	....	....	^{5}10.6	....
	Yokkaichi City	166,300	70,300	....	^{1}23,700	^{2}5,400 ^{6}9,900	....	^{2}31,500	^{1}15,300 ^{4}61,800 ^{6}5,850	....	....	5,850	....	^{5}12.0	....
	Fuji Oil CL–Sodegaura	126,600	79,600	^{6}19,000	^{1}14,000	^{2}13,600	....	^{2}52,400	^{1}27,000 ^{4}41,600 ^{7}6,800	....	....	....	....	^{2}27.9	....
	General Sekiyu Seisei KK–Sakai	140,400	63,000	....	^{1}32,500	^{2}26,100	....	^{3}36,000	^{2}36,000 ^{4}54,300	....	^{1}17,300	....	....	^{2}21.6	....
	Idemitsu Kosan CL–Chita, Aichi	123,500	....	....	^{1}27,000	^{5}16,200	....	^{1}49,500	^{1}23,400 ^{4}43,200	^{1}5,400	....	....	....	^{2}63.8 ^{4}13.2	....
	Himeji, Hyogo	104,500	....	....	....	^{2}12,600	....	^{1}36,000	^{1}25,200 ^{4}31,500	....	....	....	....	^{2}33.6	....
	Ichihara, Chiba	199,500	57,000	....	^{1}37,800	^{2}15,300	^{3}9,450	^{1}36,000 ^{3}35,100 ^{5}5,400	^{1}38,700 ^{4}47,700	....	....	5,170	7,900	^{2}64.9 ^{5}3.5	....
	Tokuyama, Yamaguchi	95,000	47,500	....	^{1}20,700	....	....	^{3}40,500	^{1}13,500 ^{4}31,500	....	....	....	1,530	^{2}18.0	....
	Tomakomai, Hokkaido	85,500	19,000	....	^{2}16,200	....	^{1}13,500	....	^{1}24,300 ^{4}22,860	....	....	....	....	^{4}2.4	....
	Kainan Petroleum Refining CL–Kainan	64,000	37,500	....	....	....	....	....	^{4}21,500 ^{6}9,000	....	....	11,600	17,500	^{2}4.0	....
	Kashima Oil CL–Kashima, Ibaragi	150,000	67,000	....	^{1}17,500	^{5}14,000	....	^{1}20,000 ^{2}25,000 ^{4}35,000	^{1}14,500	....	....	....	....	^{2}22.5	....
	Koa Oil CL–Marifu	110,000	49,000	^{5}22,800	^{1}20,000	^{2}9,700	....	^{2}10,000	^{1}11,000 ^{4}29,000	....	....	....	1,700	^{2}6.6	500
	Osaka	80,000	55,000	....	^{1}18,000	^{2}9,000	....	^{2}15,000	^{1}11,000 ^{4}14,000	....	....	....	....	....	....
	Kyokuto Petroleum Ltd.–Chiba	120,000	55,000	....	....	^{2}19,000	^{1}28,000	....	^{1}23,000 ^{4}20,000	....	....	....	....	^{2}20.0	....
	Kyushu Oil CL–Oita	130,000	66,000	....	^{1}16,500	^{2}8,000	....	^{2}33,000 ^{4}27,000	^{1}9,000	....	....	....	....	^{5}14.9	....
	Mitsubishi Oil CL–Kawasaki	55,000	5,800	....	....	^{2}8,500	....	^{4}17,000	^{1}8,500	....	....	....	1,800	....	....
	Mizushima	220,000	97,000	....	^{1}34,000	^{2}25,000 ^{6}18,500	....	^{1}45,000 ^{2}30,000 ^{3}11,000 ^{4}25,000	^{1}40,200 ^{3}14,000 ^{6}4,100	*880	^{1}12,700	2,800	5,700	^{2}60.0	....
	Nansei Sekiyu KK–Nishihara, Okinawa	45,000	....	....	....	^{1}8,600	....	....	^{2}21,100 ^{4}13,500	....	....	....	....	....	....
	Nichimo Sekiyu Seisei KK–Kawasaki	76,000	....	....	....	^{1}7,600	....	....	^{2}7,200 ^{4}22,800	....	....	....	....	....	....
	Nihonkai Oil CL–Toyama	50,000	....	....	....	4,000	....	....	5,000	....	....	....	....	....	....
	Nippon Mining CL–Chita	85,000	40,000	....	^{1}13,000	^{2}22,000	....	^{2}37,000	^{2}43,000 ^{4}46,000	....	^{1}11,000 ^{2}3,000 ^{3}1,450	....	....	^{1}23.7 ^{4}9.2	....

			Charge capacity, b/cd							Production capacity, b/cd					
	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	Funakawa	6,000	2,740	....	....	....	....	....	....	....	....	1,070	....	....	....
	Mizushima	190,200	107,000	....	[1]38,000	[2]20,000	....	[1]31,000 [2]60,000	[2]28,300 [4]59,600 [6]6,000	[1]9,000	....	4,900	....	[1]27.0 [2]28.3	....
	Nippon Oil CL–Niigata	26,000	2,000	....	[2]4,000	....	....	....	[5]21,300	....	....	....	425	....	....
	Nippon Petroleum Refining CL–Muroran	150,000	61,000	....	[1]21,000	[2]21,000	[1]40,000	[1]12,500	[1]32,000 [5]48,000	....	....	....	4,160	[5]62.0	....
	Nakagusuku, Okinawa	....	....	....	....	[2]2,500	....	....	[1]2,500	....	....	....	....	....	....
	Negishi	305,000	110,000	[3]20,000	[1]39,000	[2]20,000 [6]30,000	....	[2]81,000	[1]53,000 [5]69,000 [7]3,000	[1]6,000	....	4,310	6,660	[5]22.0	....
	Yokohama	....	18,500	....	....	[2]1,300	....	....	[1]3,300 [5]7,300	....	....	1,250	....	....	....
	Okinawa Sekiyu Seisei–Yonashiro, Okinawa	57,000	....	....	....	....	....	[1]34,200 [2]13,500	[4]18,000	....	....	....	....	[2]42.7	....
	Seibu Oil CL–Yamaguchi	110,100	42,200	....	[1]18,100	[2]17,800	....	[1]40,100 [2]24,900	[2]48,300 [4]26,800	....	....	....	....	[1]42.4	....
	Showa Shell Sekiyu KK–Kawasaki	136,800	27,500	....	....	[2]19,100	....	[2]7,600 [5]14,200	[2]30,300 [4]18,700	....	[6]5,500	....	....	....	....
	Niigata	27,500	....	....	....	[2]4,300	....	....	[2]11,600 [4]2,000	....	....	....	....	....	....
	Showa Yokkaichi Sekiyu CL–Yokkaichi	215,700	96,300	....	[1]22,600	[2]38,100	....	[2]37,000 [5]35,600	[2]61,400 [4]39,200	....	[7]7,600 [6]5,000	5,500	6,300	[1]28.3	....
	Taiyo Oil CL–Ehime	61,750	19,000	....	....	[2]5,400	[1]10,800	....	[1]7,380 [4]10,800	....	....	....	....	[2]54.7	....
	Toa Nenryo Kogyo–Kawasaki	190,000	116,900	....	[1]74,100	[2]15,200	....	[3]74,000	[2]32,300 [4]31,400 [5]11,400	*9,500	....	....	....	[2]39.0	....
	Wakayama	157,700	58,600	....	[1]31,600	[2]34,200	....	[2]23,800	[2]33,700 [4]39,000 [5]20,900	[1]3,100	....	6,100	....	[1]16.0	....
	Toa Oil CL–Kawasaki	65,000	53,000	[6]21,000	....	[2]11,000	....	....	[2]17,000 [3]3,500 [4]22,000 [5]46,000	....	....	....	....	[1]34.7	150
	Toho Oil CL–Owase	35,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Tohoku Oil CL–Sendai	75,700	50,200	....	....	[2]11,300	....	[2]29,200	[1]11,200 [4]17,300	....	....	....	4,800	....	....
	Total	**4,362,750**	**1,698,940**	**82,000**	**596,950**	**551,650**	**101,750**	**1,370,280**	**1,973,740**	**33,880**	**63,550**	**48,550**	**58,475**	**944.5**	**650**
JORDAN	Jordan Petroleum Refinery–Zerka	100,000	16,900	...	[1]4,410	[2]8,640	[1]4,800	....	[1]15,100 [4]2,000	....	....	....	....	[2]7.9	....
	Total	**100,000**	**16,900**	**....**	**4,410**	**8,640**	**4,800**	**....**	**17,100**	**....**	**....**	**....**	**....**	**7.9**	**....**
KENYA	Kenya Petroleum Refineries Ltd.–Mombasa	90,000	1,700	....	....	[1]3,800 [2]5,200	....	....	[4]33,000	....	....	....	....	....	....
	Total	**90,000**	**1,700**	**....**	**....**	**9,000**	**....**	**....**	**33,000**	**....**	**....**	**....**	**....**	**....**	**....**
KOREA, N.	Government-owned, Unggi	**42,000**													

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd				Hydrogen, MMcfd	Coke, tons/day
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. °Poly.	Aromatics/ isomerization	Lubes	Asphalt		
KOREA, S.	Honam Oil Refinery CL–Yoso	355,000	....	[3]30,000	....	[2]15,300	....	....	[2]22,500	....	....	....	3,600	....	....
	Kukdong Oil CL–Busan[1]	10,000	7,000	....	....	....	....	....	[2]2,000 [6]1,200	....	....	2,000	4,000	[2]0.4	....
	Daesan	60,000	34,000	[5]19,000	....	[2]3,000	[1]22,000	....	[2]6,000 [4]12,000	....	....	....	....	[2]54.0	1,200
	Kyung In Energy CL–Inchon	60,000	....	....	....	[2]3,600	....	....	[1]3,600 [4]4,000	....	....	....	....	....	....
	Ssangyong Oil Refining CL–Onsan[2]	90,000	22,000	....	....	[1]4,000	[3]7,000	[4]21,000	[1]4,000 [2]1,100 [6]2,400	....	....	4,200	5,000	[2]14.0	....
	Yukong Ltd.–Ulsan	305,000	4,400	....	....	[2]17,650 [6]18,900	....	....	[1]38,900 [4]10,500 [7]2,600	....	[1]11,930 [2]4,900 [3]800	....	2,600	....	....
	Total	**880,000**	**67,400**	**49,000**	**....**	**62,450**	**29,000**	**21,000**	**110,800**	**....**	**17,630**	**6,200**	**15,200**	**68.4**	**1,200**
	Solvent extraction: [1]2,100 b/d. [2]8,000 b/d.														
KUWAIT	Getty Oil Co. (subsidiary of Texaco Inc.)–Mina Al-Zour	70,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Kuwait National Petroleum Co.–Mina Abdulla	190,000	117,000	[5]54,000	....	....	[1]34,000	[1]88,000	[2]7,000 [4]66,000	....	....	....	....	[1]161.0	1,900
	Mina Al-Ahmadi	370,000	90,000	....	[1]28,000	[2]33,000	[1]34,000	[1]117,000	[1]34,000 [4]66,000	....	....	....	5,000	[1]156.0	....
	Shuaiba	187,000	131,000	....	[2]14,000	....	[1]60,000 [2]42,000	....	[1]25,000 [4]65,000	....	....	....	....	[1]210.0	....
	Total	**817,000**	**338,000**	**54,000**	**42,000**	**33,000**	**170,000**	**205,000**	**263,000**	**....**	**....**	**....**	**5,000**	**527.0**	**1,900**
LEBANON	Tripoli Oil Installations–Tripoli	20,000	12,730	....	[1]7,250	[2]4,392	....	[2]7,392	....	....	....	....	409	....	....
	Mediterranean Refining Co.–Sidon	17,000	....	....	....	[1]3,100	....	....	[1]3,100	....	....	....	....	....	....
	Total	**37,000**	**12,730**	**....**	**7,250**	**7,492**	**....**	**7,392**	**3,100**	**....**	**....**	**....**	**409**	**....**	**....**
LIBERIA	Liberia Petroleum Refining–Monrovia	15,000	1,000	....	....	[1]2,000	....	....	[1]2,300 [4]1,000	....	....	....	200	....	....
	Total	**15,000**	**1,000**	**....**	**....**	**2,000**	**....**	**....**	**3,300**	**....**	**....**	**....**	**200**	**....**	**....**
LIBYA	Azzawiya Oil Refining Co.–Azzawiya	120,000	3,432	....	....	[2]12,982	....	....	16,908 [5]18,718	....	....	635	1,716	....	....
	Ras Lanuf Oil & Gas Processing Co.–Ras Lanuf	201,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Sirte Oil Co.–Brega	8,400	....	....	....	[1]1,000	....	....	[2]1,500	....	....	....	....	....	....
	Total	**329,400**	**3,432**	**....**	**....**	**13,982**	**....**	**....**	**37,126**	**....**	**....**	**635**	**1,716**	**....**	**....**
MADAGASCAR	Solima–Managareza, Tamatave	**16,350**	**1,200**	**[3]7,000**	**....**	**[1]2,600**	**....**	**[2]3,600**	**[1]5,500**	**....**	**....**	**....**	**....**	**....**	**....**
MALAYSIA	Esso Malaysia Berhad–Port Dickson	47,300	4,750	....	....	[2]7,980	....	....	[1]14,250 [4]13,600		....	....	....	....	....
	Petronas Penapisan Sdn. Berhad–Kerteh, Kemaman, Terengganu	27,000	....	....	....	....	....	....	....	....	....	..	....	....	....
	Sarawak Shell Berhad–Luton	45,000	....	....	....	....	....	....	....	....	....	....	....	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd: Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Production capacity, b/cd: Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	Shell Refining Co. Berhad–Port Dickson	90,000	2,400	....	....	^{1}4,000 ^{2}10,000	....	....	^{2}28,000 ^{4}5,000	....	....	....	1,700	....	....
	Total	**209,300**	**7,150**	....	....	**21,980**	....	....	**60,850**	....	....	....	**1,700**	....	....
MARTINIQUE	Ste. Anonyme de la Raffinerie des Antilles–Fort-de-France	12,800	....	....	....	^{2}7,410	....	....	^{1}4,850 ^{4}3,500	....	....	....	....	....	....
	Total	**12,800**	....	....	....	**7,410**	....	....	**8,350**	....	....	....	....	....	....
MEXICO	Petroleos Mexicanos–Azcapotzalco	110,000	48,000	^{3}20,000	^{1}24,000	....	....	....	....	^{2}1,200 *430	....	....	....	....	....
	Cadereyta	235,000	137,000	....	^{1}40,000	^{2}20,000	....	^{4}50,000	^{1}36,000	....	....	....	....	....	....
	Ciudad Madero[1]	195,000	81,500	^{3}8,000 ^{4}9,000	^{1}43,000	^{2}15,000	....	^{4}37,000	^{1}15,000	^{2}1,200 *430	....	....	....	^{1}10.0	260
	Minatitlan	200,000	83,000	....	^{1}24,000 ^{2}16,000	^{2}48,000	....	^{4}37,000	^{1}52,000	*600	^{1}6,820 ^{2}1,400 ^{3}2,374	500	....	....	....
	Poza Rica	50,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Reynosa	9,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Salamanca	235,000	101,200	^{3}4,000	^{1}40,000	^{2}24,800	^{2}18,000	^{2}26,000	^{1}33,000 ^{6}10,000	....	....	15,000	15,000	^{1}60.0	....
	S[illegible] Cruz	165,000	75,000	....	^{1}40,000	^{6}20,000	....	^{4}50,000	^{1}25,000	....	....	....	....	....	....
	[illegible]a, Hidalgo	155,000	75,000	^{3}41,000	^{2}40,000	^{2}30,000	....	^{4}50,000	^{1}36,000	....	....	....	....	....	....
	Total	**1,354,000**	**600,700**	**82,000**	**267,000**	**157,800**	**18,000**	**250,000**	**207,000**	**3,860**	**10,594**	**15,500**	**15,000**	**70.0**	**260**

Solvent extraction: ^{1}38,000 b/cd.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
MOROCCO	Samir–Mohammedia	129,000	20,000	....	....	^{2}24,000	....	....	^{1}24,000 ^{5}9,700 ^{6}2,100	....	....	2,100	13,700	....	....
	Ste. Cherifienne des Petroles–Sidi Kacem	25,600	7,400	....	^{2}5,600	^{1}2,800	....	....	^{1}2,800	....	....	....	....	....	....
	Total	**154,600**	**27,400**	....	**5,600**	**26,800**	....	....	**38,600**	....	....	**2,100**	**13,700**	....	....
NETHERLANDS	BP Raffinaderij Nederland NV–Rotterdam	437,000	73,000	^{3}35,000	^{1}47,500	^{2}27,000	....	^{4}33,200	^{2}148,000	^{2}4,700	....	....	....	....	....
	Esso Nederland BV–Rotterdam	155,000	66,500	^{6}31,500	....	^{4}25,200	....	....	^{1}25,200 ^{2}9,900 ^{4}61,200 ^{5}13,500	....	....	....	....	^{1}21.0	....
	Kuwait Petroleum Europoort BV–Rotterdam[1]	75,500	32,870	^{2}9,460 ^{3}6,400	....	^{2}8,200	....	....	^{1}12,120 ^{4}28,400 ^{6}6,000	....	....	4,600	3,320	....	....
	Shell Nederland Raffinaderij BV–Pernis	348,000	148,000	^{3}45,000	^{1}78,000	^{2}17,000 ^{6}42,000	....	^{2}77,000	^{2}138,000 ^{3}8,000 ^{6}300	^{2}6,800	....	7,100	5,500	....	....
	Smid & Hollander Raffinaderij BV–Amsterdam	8,200	6,000	....	....	....	....	....	....	....	....	....	5,500	....	....
	Texaco Petroleum Mij. (Nederland) BV–Pernis	207,000	28,000	^{3}27,000	....	^{2}29,000	....	^{4}38,000	^{1}29,000	....	....	....	....	....	....

WORLDWIDE REFINING	Company and refinery location		Charge capacity, b/cd							Production capacity, b/cd					
		Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	Total Raffinaderij Nederland NV–Vlissingen	150,000	45,000	....	....	[6]18,000	[1]30,000	....	[1]18,000 [5]25,000	....	....	....	....	[1]65.0	....
	Total	**1,380,700**	**399,370**	**154,360**	**125,500**	**166,400**	**30,000**	**148,200**	**522,620**	**11,500**	**....**	**11,700**	**14,320**	**86.0**	**....**
	Solvent extraction: [1]3,200 b/cd.														
NETHERLANDS ANTILLES	Refineria Isla Curazao SA–Emmastad	320,000	158,000	[2]67,000	[1]42,000	[2]15,000	....	....	[2]60,000 [4]34,000 [5]25,000 [6]2,500	[2]5,000 *600	....	8,000	8,000	....	....
	Total	**320,000**	**158,000**	**67,000**	**42,000**	**15,000**	**....**	**....**	**121,500**	**5,600**	**....**	**8,000**	**8,000**	**....**	**....**
NEW ZEALAND	New Zealand Refining–Whangarei	88,400	36,600	....	....	[2]21,900	[1]21,500	[2]6,500	[2]35,600 [4]11,800	....	....	....	2,300	[1]44.0	....
	Total	**88,400**	**36,600**	**....**	**....**	**21,900**	**21,500**	**6,500**	**47,400**	**....**	**....**	**....**	**2,300**	**44.0**	**....**
NICARAGUA	Esso Standard Oil SA Ltd.–Managua	14,500	2,000	....	....	[1]2,800	....	....	[2]4,800 [7]5,200	....	....	....	800	....	....
	Total	**14,500**	**2,000**	**....**	**....**	**2,800**	**....**	**....**	**10,000**	**....**	**....**	**....**	**800**	**....**	**....**
NIGERIA	Nigerian Petroleum Refining CL–Kaduna[1]	104,500	36,290	....	[1]18,000	[2]15,300	....	....	[1]21,600 [4]15,750 [7]536	....	[2]291	3,878	14,850	....	....
	Port Harcourt, Alesa Eleme	60,000	....	....	....	[1]6,000	....	....	....	....	....	....	....	....	....
	Port Harcourt, Rivers State	150,000	54,000	....	[1]40,000	[6]33,000	....	....	[1]33,000 [5]14,500	[2]7,020 †2,274	[4]3,610	....	....	....	....
	Warri	100,000	32,000	....	[1]26,000	[2]16,700	....	....	[1]16,700 [5]8,600	....	....	....	....	....	....
	Total	**414,500**	**122,290**	**....**	**84,000**	**71,000**	**....**	**....**	**110,686**	**9,294**	**3,901**	**3,878**	**14,850**	**....**	**....**
	Solvent extraction: [1]8,573 b/cd. †Dimersol														
NORWAY	Esso Norge AS–Slagen-Valloy	90,000	4,000	[3]28,000	....	[2]10,000	....	....	[2]20,000 [5]9,000	....	....	....	4,000	....	....
	Norske Shell AS–Sola	60,000	....	[3]26,000	....	[2]10,000	....	....	[1]16,000 [4]9,000	....	....	....	....	....	....
	Rafinor AS–Mongstad	89,400	....	[5]23,300	....	[2]10,100	....	....	[2]10,100 [5]15,600	....	[6]3,600	....	....	....	480
	Total	**239,400**	**4,000**	**77,300**	**....**	**30,100**	**....**	**....**	**79,700**	**....**	**3,600**	**....**	**4,000**	**....**	**480**
OMAN	Oman Refinery Co.–Mina Al Fahal	**76,932**	**....**	**....**	**....**	**[2]15,386**	**....**	**....**	**[2]19,506**	**....**	**....**	**....**	**....**	**....**	**....**
PAKISTAN	Attock Refinery Ltd.–Rawalpindi	36,000	1,000	....	....	....	....	....	....	....	....	115	100	....	....
	National Refinery Ltd.–Korangi, Karachi	47,750	13,200	....	....	[2]2,750	....	....	[1]2,800 [4]4,000	....	[1]1,250	3,700	3,950	[1]0.1	....

			Charge capacity, b/cd							Production capacity, b/cd					
WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	Pakistan Refinery Ltd.–Karachi	46,300	....	....	....	[1]2,700	....	....	[7]18,000	....	....	....	....	....	....
	Total	**130,050**	**14,200**	....	....	**5,450**	....	....	**24,800**	....	**1,250**	**3,815**	**4,050**	**0.1**	....
PANAMA	Refinería Panama SA–Las Minas	100,000	14,000	....	....	[2]7,500	....	....	[1]10,000 [4]20,000	....	....	....	5,000	....	....
	Total	**100,000**	**14,000**	....	....	**7,500**	....	....	**30,000**	....	....	....	**5,000**	....	....
PARAGUAY	Petroleos Paraguayos–Villa Elisa	**7,500**	....	....	....	....	....	....	....	....	....	....	....	....	....
PERU	Petróleos del Peru:														
	Conchan	5,670	3,915	....	....	....	....	....	....	....	....	....	....	....	....
	Iquitos, Loreto	9,450	....	....	....	....	....	....	....	....	....	....	....	....	....
	La Pampilla, Lima	93,900	11,400	....	[1]7,600	[3]1,680	....	....	....	....	....	....	....	....	....
	Marsella, Loreto	1,953	....	....	....	....	....	....	....	....	....	....	....	....	....
	Pucallpa	2,565	....	....	....	....	....	....	....	....	....	....	....	....	....
	Talara	58,900	21,600	....	[1]14,940	....	....	....	....	....	....	1,080	1,530	....	....
	Total	**172,438**	**36,915**	....	**22,540**	**1,680**	....	....	....		....	**1,080**	**1,530**	....	....
PHILIPPINES	Caltex (Philippines) Inc.–Batangas	63,000	18,100	....	[1]8,100	[2]8,100	....	....	[1-2]10,800 [4]14,400	....	....	....	....	....	....
	Petron Corp.–Limay, Bataan	130,000	20,000	....	[2]15,000	[1]23,800	....	[4]18,000	[2]52,000	....	....	....	5,000	....	....
	Philippine Petroleum Corp.–Pililla	....	20,500	....	....	....	....	....	....	....	....	3,400	....	....	....
	Pilipinas Shell Petroleum–Tabangao	61,000	....	....	....	[1]7,500	....	[2]5,000	[4]14,000	....	....	....	....	....	....
	Total	**254,000**	**58,600**	....	**23,100**	**39,400**	....	**23,000**	**91,200**	....	....	**3,400**	**5,000**	....	....
POLAND	Government-owned refineries at Czechowice, Gdańsk, Glinik Mariampolski, Jasto, Jealicze, Kralaty, L. Warynski, Plock, Trzebinia. Of these, Plock is by far the largest, accounting for roughly 80% of Polish refinery production. Its crude capacity is nearly 300,000 b/d.														
	Total	**385,000**													
PORTUGAL	Petrogal–Lisbon	....	18,900	....	[2]10,100	....	....	[1]3,400	....	....	....	....	700	....	....
	Leça da Palmeira, Porto	88,300	11,000	....	....	[2]14,200 [4]10,500	....	....	[1]38,400 [4]7,300 [6]3,000	....	[1]8,200	3,000	2,700	....	....
	Sines	225,000	25,400	....	....	[5]27,500	[4]10,200	[4]31,400 [5]15,000	[1]27,500	....	....	....	2,400	....	....
	Total	**313,300**	**55,300**	....	**10,100**	**52,200**	**10,200**	**49,800**	**76,200**	....	**8,200**	**3,000**	**5,800**	....	....
PUERTO RICO	Caribbean Petroleum Corp.–Bayamón	38,000	19,300	....	[1]12,000	[2]5,800	....	....	....	*1,000	....	....	900	....	....
	Yabucoa Sun Oil Co.–Yabucoa[1]	85,000	40,000	....	....	....	[3]15,000	[4]12,000	....	....	....	9,000	....	[2]18.0	....
	Total	**123,000**	**59,300**	....	**12,000**	**5,800**	**15,000**	**12,000**	....	**1,000**	....	**9,000**	**900**	**18.0**	....
	Solvent extraction: [1]16,000 b/cd.														
QATAR	National Oil Distribution Co.–Umm Said	62,000	....	....	....	[2]2,200 [6]9,830	....	....	[2]17,240 [4]10,500 [5]11,900	....	....	....	....	....	....
	Total	**62,000**	....	....	....	**12,030**	....	....	**39,640**	....	....	....	....	....	....

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
ROMANIA	Government-owned refineries at Bacau, Borzesti, Brazi, Brazov, Cimpina, Darmanesti, G. Gheorghiu Dej, Navodari, Onesti, Pitesti, Ploesti, Sulpacu, and Telaejen.														
	Total	**617,000**													
SAUDI ARABIA	Arabian American Oil Co.–Ras Tanura	450,000	30,000	....	....	^{4}60,000	....	....	^{1}60,000	....	....	....	12,500	....	....
	Arabian Oil CL–Ras Al Khafji	30,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Jeddah Oil Refinery–Jeddah	91,000	15,000	....	^{1}10,000	^{2}2,900	....	....	....	....	....	....	2,500	....	....
	Petromin-Mobil–Yanbu	250,000	106,000	....	^{1}66,000	^{6}32,000	....	....	^{1}32,000 ^{4}40,000	^{2}12,500	....	....	10,000	....	....
	Petromin-Shell–Al-Jubail[1]	250,000	77,000	^{3}32,000	....	^{6}17,000	^{2}39,000	^{1}40,000	^{1}17,000 ^{2}52,000 ^{4}45,000	....	^{1}5,300 ^{2}6,100	....	....	^{1}84.0	....
	Riyadh Oil Refinery–Riyadh[2]	134,000	52,655	....	....	^{2}28,600 ^{5}5,400	^{2}31,100	....	^{2}30,900 ^{4}12,900	....	8,000	....	5,500	117.0	....
	Yanbu Petromin Refinery–Yanbu	170,000	....	....	....	^{2}35,000	....	....	^{1}35,000 ^{4}15,200	....	....	....	....	....	....
	Total	**1,375,000**	**280,655**	**32,000**	**76,000**	**180,900**	**70,100**	**40,000**	**348,000**	**12,500**	**19,400**	....	**30,500**	**201.0**	....

Solvent extraction: [1] 12,500 b/cd. [2] 8,800 b/cd.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
SENEGAL	Ste. Africaine de Raffinage–M'Bao (Dakar)	**29,800**	**18,800**	....	....	**^{4}2,870**	....	....	....	....	....	....	....	....	....
SIERRA LEONE	Sierra Leone Petroleum Refining Co.–Freetown	**10,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
SINGAPORE	BP Refinery Singapore PL–Pasir Panjang	28,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Esso Singapore PL–Pulau Ayer Chawan	170,000	41,800	....	....	^{2}8,600	....	....	^{2}19,000 ^{4}48,400	....	....	7,000	3,400	....	....
	Mobil Oil Singapore PL–Jurong	193,000	70,000	^{3}45,000	....	^{2}18,000	....	....	^{1}22,000 ^{4}36,000	....	....	....	....	....	....
	Shell Eastern Petroleum Ltd.–Pulau Bukom	300,000	85,600	^{2}64,700	....	^{2}6,800 ^{6}13,900	^{1}21,600	^{2}44,600	^{2}18,700 ^{4}88,300	....	....	5,800	4,300	^{1}40.0	....
	Singapore Refinery CPL†–Pulau Merlimau	161,000	58,700	^{3}28,000	....	^{4}11,000	^{1}9,500 ^{4}17,000	^{4}36,000	^{1}11,000	....	....	....	4,300	^{2}18.0 ^{4}14.0 ^{5}7.0	....
	Total	**852,000**	**256,100**	**137,700**	....	**58,300**	**48,100**	**80,600**	**243,400**	....	....	**12,800**	**12,000**	**79.0**	....

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†Singapore Petroleum CPL shares percentages of refinery capacities.

WORLDWIDE REFINING	Company and refinery location	Crude	Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
SOMALIA	Iraqsoma Ref. Co.–Mogadishu	**10,000**	....	....	....	....	....	....	....	....	....	....	....	....	....
SOUTH AFRICA	Caltex Oil SA PL–Cape Town	90,000	44,000	^{3}9,500	^{1}25,000	^{2}10,500	....	^{4}22,300	^{1}14,250	....	....	....	1,140	....	....
	Mobil Oil Refining Co.–Southern Africa PL–Durban	65,000	32,000	^{3}11,000	^{1}15,000	^{2}15,000	....	....	^{1}21,000 ^{5}28,000	^{2}2,200	^{4,6}6,000	....	4,000	....	....
	†Durban	....	....	....	....	....	....	....	....	....	....	3,000	....	....	....

	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
	National Petroleum Refiners of South Africa PL–Sasolburg OFS	78,500	28,000	....	^{1}17,400	^{2}11,300	^{1}8,600 ^{2}9,400	...	^{1}11,300 ^{4}10,600	^{2}4,800	^{4}3,400	....	1,000	^{1}25.0 ^{5}9.0	....
	Shell and BP South Africa Petroleum Refineries PL–Durban	200,000	....	^{3}43,000	^{1}27,000	^{2}26,000	....	^{4}55,000	^{4}57,000	....	....	....	....	....	....
	Total	**433,500**	**104,000**	**63,500**	**84,400**	**62,800**	**18,000**	**77,300**	**142,150**	**7,000**	**9,400**	**3,000**	**6,140**	**34.0**	....
	†South African Oil Refinery PL is owner; Mobil is operator.														
SPAIN	Asfaltos Españoles SA–Tarragona	21,000	16,800	....	....	....	....	....	....	....	....	....	15,000	....	....
	Cia. Española de Petróles–San Roque (Cádiz)	160,000	40,000	^{3}35,000	^{1}36,000	^{2}35,000	....	....	^{4}24,000 ^{5}15,000	....	^{1}12,500 ^{2}1,800	....	....	....	....
	Tenerife	130,000	12,000	^{3}35,000	....	^{2}13,000	....	....	^{3}20,000	....	....	....	8,000	....	....
	Petróleos del Mediterraneo–Castellón de la Plana	112,000	24,000	....	^{1}14,000	^{2}14,000	....	^{2}11,000 ^{4}25,000	^{2}25,000	....	....	....	1,650	....	....
	Petronor SA–Somorrostro, Vizcaya	220,000	90,000	^{3}40,000	^{1}40,000	^{2}30,500	....	^{3}35,000	^{2}45,000 ^{4}40,000	....	....	....	1,670	^{2}12.0	....
	Repsol Petroleo SA–Cartagena, Murcia	112,000	18,000	....	....	^{3}25,000	....	^{4}30,000	^{2}29,000	....	....	3,500	3,500	....	....
	La Coruña	135,000	29,000	^{2}10,500 ^{5}13,500	^{1}28,000	^{2}22,000	....	^{4}17,000	^{1}22,000	....	....	....	....	....	550
	Puertollano, Ciudad Real	135,000	62,000	....	^{1}30,000	^{2}18,000	....	^{2}9,500 ^{4}22,000	^{2}18,000	^{2}1,700	....	3,000	3,500	^{2}6.2	....
	Tarragona	180,000	72,000	^{3}30,000	^{2}16,000	....	^{1}15,000	^{2}22,000 ^{4}20,600	^{2}16,000	....	....	....	....	^{1}10.0	....
	Unión Explosivos Rio Tinto SA–La Rábida, Huelva	80,000	25,000	^{3}9,000	....	^{2}14,100	....	....	^{1}14,100 ^{4}8,000 ^{6}2,800	....	^{1}2,420 ^{2}3,500 ^{3}1,800	1,900	6,900	^{1}25.0 ^{5}6.0	....
	Total	**1,285,000**	**388,800**	**173,000**	**164,000**	**171,600**	**15,000**	**192,100**	**278,900**	**1,700**	**22,020**	**8,400**	**40,220**	**59.2**	**550**
SRI LANKA	Ceylon Petroleum Corp.–Sapugaskanda	50,000	2,400	^{3}12,500	....	^{2}3,750	....	^{2}2,100	^{1}6,000 ^{4}7,300	....	....	....	1,000	....	....
	Total	**50,000**	**2,400**	**12,500**	....	**3,750**	....	**2,100**	**15,300**	....	....	....	**1,000**	....	....
SUDAN	Port Sudan Refinery Ltd.–Port Sudan	**21,440**	....	....	....	^{1}**1,700**	....	....	^{4}**7,400**	....	....	....	....	....	....
SWEDEN	AB Nynas Petroleum–Gothenburg	12,500	9,000	....	....	....	....	....	....	....	....	....	8,500	....	....
	Nynäshamn	28,000	31,000	....	....	....	....	....	^{6}2,500	....	....	2,500	20,000	^{2}1.9	....
	BP Raffinaderi–Gothenburg	106,000	....	....	....	^{2}20,500	....	....	^{4}45,000	....	....	....	....	....	....
	Shell Raffinaderi BV–Gothenburg	80,000	17,000	^{2}27,000	....	^{2}16,000	....	^{2}16,000	^{2}22,000 ^{4}5,000	....	^{5}4,000	....	....	....	....
	Skandinaviska Raffinaderi AB–Brofjorden-Lysekil	200,000	65,000	^{3}40,000	^{1}25,000	^{2}34,500	....	^{2}44,000 ^{4}30,500	^{2}43,500	*3,500	....	....	....	....	....
	Total	**426,500**	**122,000**	**67,000**	**25,000**	**71,000**	....	**90,500**	**118,000**	**3,500**	**4,000**	**2,500**	**28,500**	**1.9**	....
SWITZERLAND	Raffinerie de Cressier SA–Cressier	60,000	24,000	^{2}11,000 ^{3}9,000	....	^{2}16,000	....	^{2}8,000	^{1}27,000 ^{4}5,500	....	^{6}3,600	....	5,200	....	....
	Raffinerie du Sud-Ouest SA–Collombey	72,000	....	....	....	^{2}10,000	....	....	^{1}16,700	....	....	....	....	....	....
	Total	**132,000**	**24,000**	**20,000**	....	**26,000**	....	**8,000**	**49,200**	....	**3,600**	....	**5,200**	....	....

WORLDWIDE REFINING		Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
				Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
SYRIA		Banias Refining Co.–Banias	126,350	54.101	^{3}24,099	....	^{4}16,728	....	....	^{1}16,769 ^{4}6,828	....	....	....	4,016	....	....
		Homs Refinery Co.–Homs	117,394	7,245	^{3}12,285	....	^{2}2,266	....	^{2}3,024 ^{4}15,660	^{5}14,266 ^{1}3,172 ^{4}6,720	....	....	....	4,474	^{2}9.9	487
		Total	**243,744**	**61,346**	**36,384**	....	**18,994**	....	**18,684**	**47,755**	....	....	....	**8,490**	**9.9**	**487**
TANZANIA		Tanzanian & Italian Petroleum Refining CL–Kigamboni, Dar es Salaam	**13,500**	....	....	....	^{2}**3,000**	....	....	^{4}**5,000**	....	....	....	....	....	....
THAILAND		Esso Standard Thailand Ltd.–Sriracha	64,220	6,650	....	....	^{5}7,200	....	^{4}14,400	....	....	....	....	....	....	....
		Petroleum Authority of Thailand–Bangchak, Bangkok	61,750	....	....	....	^{2}9,450	....	^{5}3,150	^{1}4,950 ^{2}5,850	....	....	....	....	^{1}4.7	....
		Thai Oil CL–Sriracha	65,075	16,150	^{3}16,920	^{1}8,100	^{5}9,630	....	....	^{7}16,200 ^{2}32,000 ^{5}10,000	....	....	....	1,100	....	....
		Total	**191,045**	**22,800**	**16,920**	**8,100**	**26,280**	....	**17,550**	**69,000**	....	....	....	**1,100**	**4.7**	....
TRINIDAD		Trinidad and Tobago Oil CL–Pointe-a-Pierre	220,000	166,000	^{3}18,000	^{1}28,000	^{4}25,000	....	^{2}100,000	^{5}18,000 ^{6}3,800	^{1}2,200 *450	^{1}2,800	2,700	....	....	....
		Point Fortin	80,000	5,000	....	....	^{3}6,000	....	^{5}4,500	^{4}20,000	....	....	....	2,000	....	....
		Total	**300,000**	**171,000**	**18,000**	**28,000**	**31,000**	....	**104,500**	**41,800**	**2,650**	**2,800**	**2,700**	**2,000**	....	....
TUNISIA		Ste. Tunisienne Industries des Raffinage–Bizerte	**34,000**	....	....	....	**3,300**	....	....	....	....	....	....	....	....	....
TURKEY		Anadolu Tasfiyehanesi AS–Mersin	90,000	....	....	....	^{2}10,500	....	....	^{1}22,000 ^{4}11,500	....	....	....	....	....	....
		Turkish Petroleum Refineries Corp.:														
		Aliaga-Izmir^{1}	249,000	37,500	....	^{1}14,000	^{2}10,700	....	....	^{1}12,000 ^{4}14,500	....	....	4,000	10,000	^{5}0.4	....
		Batman, Siirt	24,350	4,140	^{2}4,500	....	^{2}1,300	....	....	^{1}1,300	....	....	....	4,640	....	....
		Izmit	248 455	88,060	....	^{1}20,128	^{2}20,285	....	....	^{1}20,285 ^{4}6,290	....	....	....	8,800	....	....
		Kirikkale	112,849	29,676	....	....	^{2}20,342	....	^{2}15,096	^{5}36,482 ^{1}20,342 ^{2}8,825		....	....	6,177	....	....
		Total	**724,654**	**159,376**	**4,500**	**34,128**	**63,127**	....	**15,096**	**153,524**	....	....	**4,000**	**29,617**	**0.4**	....
UNITED KINGDOM	**England**	Conoco Ltd.–South Killingholme	130,000	104,000	^{2}40,000 ^{5}60,000	^{1}38,000 ^{2}50,000	....	....	....	^{4}76,000 ^{5}45,000 ^{7}30,000	*3,500	^{1}3,000 ^{6}19,000	....	....	....	2,150
		Eastham Refinery Ltd.–Eastham, Cheshire	12,000	10,500	....	....	....	....	....	....	....	....	....	8,000	....	....
		Esso Petroleum CL–Fawley	300,200	120,840	....	^{1}76,500	^{2}27,900 ^{4}22,500	....	....	$^{1-2}$73,260 $^{4-5}$104,130 ^{6}7,200	*12,600	^{6}16,150	7,200	7,650	....	....

Solvent extraction: ^{1}11,700 b/cd (furfural), 6,700 b/cd (propane deasphalting).

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd				Hydrogen, MMcfd	Coke, tons/ day
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydro-cracking	Cat hydro-refining	Cat hydro-treating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt		
	Lindsey Oil Refinery Ltd.– Killingholm, South Humberside	190,000	80,000	[3]26,000	[1]40,000	[2]33,600	....	[4]40,600	[1-2]45,400 [3]3,600	[2]4,100 *1,900	....	....	7,100	....	....
	Mobil Oil CL–Coryton, Essex	145,000	86,000	....	[1]47,000	[2]27,000	....	....	[1]35,000 [5]33,000	[2]14,500	[4]8,500	5,500	1,700	....	....
	Phillips Imperial Petroleum Ltd.– Port Clarence	100,000	....	....	....	....	....	....	....	....	....	....	....	....	....
	Shell U.K. Ltd.–Shell Haven	92,000	30,000	....	....	[6]34,000	[1]21,000	....	[1]34,000 [4]23,000	....	....	....	3,000	....	....
	Stanlow	262,000	90,000	....	[1]54,000	[2]29,000 [6]27,000	....	[2]41,000	[1]56,000 [2]14,000	....	[1]9,000 [2]5,000	4,500	8,000	....	....
	Total	**1,231,200**	**521,340**	**126,000**	**305,500**	**201,000**	**21,000**	**81,600**	**585,590**	**36,600**	**60,650**	**17,200**	**35,450**	....	**2,150**
Scotland	BP Refinery Grangemouth Ltd.– Grangemouth	178,500	76,000	....	[1]19,000	[2]32,000	....	....	[4]62,500	[2]3,800	....	....	....	[1]77.4	....
	William Briggs & Sons Ltd.—Dundee	6,400	6,000	....	....	....	....	....	....	....	....	....	4,350	....	....
	Total	**184,900**	**82,000**	....	**19,000**	**32,000**	....	....	**62,500**	**3,800**	....	....	**4,350**	**77.4**	....
Wales	Amoco UK Ltd.–Milford Haven	102,000	48,500	....	[1]31,500	[2]17,500	....	....	[2]17,500 [4]29,000	[2]3,100 †1,200	....	....	....	....	....
	BP Refinery Llandarcy Ltd.– Llandarcy, Neath	....	27,000	....	....	....	....	....	....	....	....	4,400	....	....	....
	Gulf Oil-GB–Milford Haven	105,000	37,000	....	....	[2]18,000	....	....	[2]29,000 [3]14,000	....	....	....	....	....	....
	Pembroke Cracking Co. (65% Texaco, 35% Gulf Oil-GB)	....	....	....	[1]86,000	....	....	....	....	[2]22,000	[4]10,000	....	....	[5]0.8	....
	Texaco Ltd.–Pembroke, Dyfed	180,000	91,000	[3]26,000	....	[6]39,000	....	[4]34,000	[1]39,000	....	....	....	....	....	....
	Total	**387,000**	**203,500**	**26,000**	**117,500**	**74,500**	....	**34,000**	**128,500**	**26,300**	**10,000**	**4,400**	....	**0.8**	....
	Total United Kingdom	**1,803,100**	**806,840**	**152,000**	**442,000**	**307,500**	**21,000**	**115,600**	**776,590**	**66,700**	**70,650**	**21,600**	**39,800**	**78.2**	**2,150**

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†Dimersol.

URUGUAY	Ancap–La Teja, Montevideo	**33,000**	**13,000**	....	[1]**4,100**	[1]**2,500**	....	....	[4]**3,700**	....	....	....	....	....	....

U.S.S.R.

Government-owned refineries at Achinsk, Angarsk, Baku, Batumi, Chimkent, Drogobych, Fergana, Gorki, Grozny, Guryev, Ishimbai, Khabarovsk, Kherson, Kirishi, Komsomolsk, Krasnovodsk, Kremenchug, Kuibyshev, Lisichansk, Mazheikiai, Moscow, Mozyr, Nadvornaya, Nizhnekamsk, Odessa, Omsk, Orsk, Pavlodar, Perm, Polotsk, Ryazan, Saratov, Syzran, Tuapse, Ufa, Ukhta, Vannovskiy, Volgograd, and Yaroslavl.

Total **12,300,000**

WORLDWIDE REFINING	Company and refinery location	Crude	Charge capacity, b/cd							Production capacity, b/cd					
			Vacuum distillation	Thermal operations	Catalytic cracking	Cat reforming	Cat hydrocracking	Cat hydrorefining	Cat hydrotreating	Alky. *Poly.	Aromatics/ isomerization	Lubes	Asphalt	Hydrogen, MMcfd	Coke, tons/ day
VENEZUELA	Corpoven–El Palito, Carabobo	105,000	63,200	....	[1]45,000	[1]6,000	....	....	....	[1]20,500	....	....	....	....	....
	El Toreño, Barinas	4,500	....	....	....	....	....	....	....	....	....	....	....	....	....
	Puerto La Cruz, Anzoategui	195,100	....	....	[1]11,400	....	....	....	....	[1]2,100	....	....	....	....	....
	San Roque, Anzoategui	5,200	1,700	....	....	....	....	....	....	....	....	....	....	....	....
	Lagoven–Judibana, Falcon	600,000	343,600	[6]49,700	[1]76,100	....	....	[2]162,000 [4]65,300	....	[2]16,000	[4]8,400	1,890	39,800	[1]82.9	100
	Maraven–Punta Cardon, Falcon	291,300	152,100	[3]88,300	[1]60,600	....	....	[2]33,700 [4]35,100	....	[1]22,650	[4]9,900	5,700	....	[1]26.0	....
	Total	**1,201,100**	**560,600**	**138,000**	**193,100**	**6,000**	....	**296,100**	....	**61,250**	**18,300**	**7,590**	**39,800**	**108.9**	**100**
VIRGIN ISLANDS	Hess Oil Virgin Islands Corp.–St. Croix	545,000	215,000	[3]80,000	....	[2]125,000	....	[2]130,000	[2]125,000 [4]165,000	....	[1]30,000 [5]15,000	....	....	....	....
	Total	**545,000**	**215,000**	**80,000**	....	**125,000**	....	**130,000**	**290,000**	....	**45,000**	....	....	....	....
YEMEN, N.	Yemen Hunt Oil Co.–Marib	**10,000**	....	....	....	**[1]2,500**	....	....	....	....	....	....	....	....	....
YEMEN, S.	Aden Refinery Co.–Little Aden	**161,500**	**9,500**	....	....	**[1]10,800**	....	**[4]2,700**	....	....	....	....	**2,000**	....	....
	Solvent extraction: 7,920 b/cd.														
YUGOSLAVIA	Bosanski Brod[1]	112,835	44,609	....	....	[2]7,612 [6]13,500	[3]7,200	....	[1]20,200 [4]13,438	....	....	....	13,310	[1]14.0	....
	Lendava	14,600	....	....	....	....	....	....	....	....	....	....	....	....	....
	Novi Sad	63,000	30,000	....	....	[2]8,200	....	[4]4,600	[1]10,700 [4]4,400 [6]4,600	....	....	1,500	4,000	[1]0.5	....
	Pancevo	108,000	44,850	[3]21,700	[1]20,750	[2]8,800	....	[4]5,000 [5]9,370	[1]8,800	[1]3,400	[1]215	....	6,300	....	....
	Rijeka	160,000	43,000	[2]8,000	[1]21,300	[2]17,500	....	[4]3,000	[1]17,500 [6]5,000	....	[1]2,800 [2]1,535 [6]9,000	2,200	....	[1]0.4	....
	Sisak	150,000	15,700	[5]5,930	[1]10,000	[2]19,000	....	....	[1]16,900 [3]3,640 [5]2,700	....	[1]4,900	....	3,715	....	137
	Zagreb	700	600	....	....	....	....	....	....	....	....	1,200	....	....	....
	Total	**609,135**	**178,759**	**35,630**	**52,050**	**74,612**	**7,200**	**21,970**	**107,878**	**3,400**	**18,450**	**4,900**	**27,325**	**14.9**	**137**
	Solvent extraction: [1]3,300 b/cd (deasphalting).														
ZAIRE	Sozir–Muanda	**16,700**	....	....	....	**[5]3,500**	....	....	**[1]5,000**	....	....	....	....	....	....
ZAMBIA	Indeni Petroleum Refinery CL–Bwana Nkubwa Area, Ndola	**20,594**	**2,170**	....	....	**[5]5,070**	....	....	**[1]8,250**	....	....	....	....	....	....

NELSON-FARRAR COST INDEX

Refinery construction (1946 basis)

(Explained on p. 145 of the issue of Dec. 30, 1985)

	1962	1973	1985	1986	1987	Aug. 1987	July 1988	Aug. 1988
Pumps, compressors, etc.	222.5	346.9	969.9	982.6	995.0	993.8	1031.0	1035.7
Electrical machinery	189.5	220.2	497.0	504.6	511.3	513.0	519.1	520.5
Internal-comb. engines	183.4	238.3	666.7	676.9	689.4	691.3	701.0	705.4
Instruments	214.8	338.0	713.7	733.3	744.2	741.9	742.6	743.3
Heat exchangers	183.6	313.7	520.0	524.7	575.2	587.1	665.5	670.1
Misc. equip. average	198.8	291.4	673.4	684.4	703.1	705.4	731.8	735.0
Materials component	205.9	292.3	739.6	730.0	748.9	746.3	808.2	813.5
Labor component	258.8	585.2	1,297.6	1,330.0	1370.0	1380.9	1406.0	1410.0
Nelson Refinery (Inflation) Index	237.6	468.0	1,074.4	1,069.9	1121.5	1127.1	1166.9	1171.4

Refinery operating (1956 basis)

(Explained on p. 145 of the issue of Dec. 30, 1985)

	1962	1973	1985	1986	1987	Aug. 1987	July 1988	Aug. 1988
Fuel cost	100.9	186.8	878.9	548.8	554.1	600.9	427.5	440.9
Labor cost	93.9	102.9	293.4	259.4	253.5	239.6	264.2	249.9
Wages	123.9	221.2	642.3	651.8	663.2	645.3	709.3	680.8
Productivity	131.8	214.9	219.7	253.8	261.8	269.3	268.5	272.5
Invest., maint., etc.	121.7	193.0	445.8	460.0	473.2	475.6	490.3	492.2
Chemical costs	96.7	117.3	222.9	206.7	192.8	194.1	218.3	220.9
Nelson operating indexes Refinery	103.7	125.7	406.8	369.0	371.8	371.9	374.2	371.1
Process units*	103.6	168.0	551.7	430.8	435.6	448.7	400.5	401.6

*Add separate index(es) for chemicals, if any are used. See current Quarterly Costimating, first issue, months of January, April, July, and October.

These indexes are published in the first issue of each month. They are compiled by Gerald L. Farrar, Journal Contributing Editor.

Indexes of selected individual items of equipment and materials are also published on the Costimating page in the first issue of the months of January, April, July, and October.

How indexes have changed

Gerald L. Farrar
Contributing Editor

The accompanying table at right provides comparisons of refinery construction and refinery operating wages monthly for the years 1986 and 1987.

The Nelson refinery construction cost indexes are inflation indexes, while the operating indexes have a productivity factor which shows improvement with experience and increasing size of operations.

The refinery construction wage indexes shown in the table evidence a steady advance over the two-year period, with the composite indexes varying from 1302.8 in January 1986, to 1387.6 in December 1987.

In contrast, the refinery operation cost index decreased over part of the period, and remained just about the same for the rest of the time. Labor costs (last column) varied from a low of 239.6 for the month of August 1987, to a high of 290.7, recorded in March of 1986. ▪

Refinery construction and operating wages

		Refinery construction			Refinery operations		
		Skilled	Common	Composite	Wages	Productivity	Labor costs
1986	Jan	1167.7	1553.7	1302.8	652.9	241.2	270.7
	Feb	1174.4	1558.6	1308.9	641.4	225.4	284.6
	Mar	1174.4	1558.6	1308.9	665.6	228.9	290.7
	Apr	1177.8	1560.5	1311.7	655.9	246.3	266.3
	May	1178.3	1567.3	1314.5	634.6	262.9	2[illegible]1.4
	June	1191.1	1580.8	1327.5	655.5	265.1	247.3
	July	1202.8	1604.0	1344.7	647.4	257.9	251.0
	Aug	1205.0	1604.0	1344.9	649.9	265.3	245.0
	Sept	1208.9	1605.0	1347.5	652.4	257.6	253.3
	Oct	1208.3	1607.0	1347.8	648.3	261.0	248.4
	Nov	1210.6	1607.0	1349.3	659.4	266.4	247.5
	Dec	1211.1	1611.8	1351.3	658.3	267.8	245.8
	Year	1192.5	1584.9	1330.0	651.8	253.8	259.4
1987	Jan	1212.8	1612.8	1352.8	675.9	263.7	256.3
	Feb	1213.3	1613.7	1353.4	653.3	264.6	246.9
	Mar	1213.9	1613.7	1353.8	667.0	245.2	272.0
	Apr	1215.0	1613.7	1354.8	664.8	256.3	259.4
	May	1218.9	1618.6	1358.8	660.4	256.3	257.7
	June	1222.8	1630.2	1365.4	651.5	264.1	245.7
	July	1228.9	1635.0	1371.0	678.5	270.7	250.6
	Aug	1238.9	1644.7	1380.9	645.3	269.3	239.6
	Sept	1245.0	1650.5	1386.9	666.8	267.1	249.7
	Oct	1245.6	1650.5	1387.0	654.6	257.5	254.2
	Nov	1246.1	1659.1	1387.6	669.5	261.3	256.2
	Dec	1246.1	1650.5	1387.6	671.0	264.3	253.9
	Year	1228.9	1632.0	1370.0	663.2	261.8	253.5

Itemized refining cost indexes

The cost indexes may be used to convert prices at any date to prices at other dates by ratios to the cost indexes of the same date. Item indexes are published each quarter (first week issue of January, April, July, and October). In addition the Nelson Construction and Operating Cost indexes are published in the first issue of each month of The Oil and Gas Journal.

Operating cost (based on 1956 = 100.0):	1954	1972	1985	1986	1987	Aug. 1988	* References	Index for earlier year in Costimating and Questions on Technology issues
Power, industrial electrical	98.5	131.2	558.5	567.8	553.8	585.0	Code 0543	No. 13, May 19, 1958
Fuel, refinery price	85.5	152.0	836.2	522.2	527.3	419.6	Oil & Gas J.	No. 4, Mar. 17, 1958
Gulf cargoes	85.0	130.4	1088.4	601.1	702.4	522.1	Oil & Gas J.	No. 4, Mar. 17, 1958
N.Y. barges	82.6	169.6	998.4	709.4	675.9	518.9	Oil & Gas J.	No. 4, Mar. 17, 1958
Chicago low sulfur			1143.2	783.3	621.7	466.5	Oil & Gas J.	July 7, 1975
Western	84.3	168.1	1094.8	514.8	733.1	569.7	Oil & Gas J.	No. 4, Mar. 17, 1958
Central	60.2	128.1	1248.1	665.1	794.7	643.4	Oil & Gas J.	No. 4, Mar. 17, 1958
Natural gas at wellhead	83.5	190.3	2171.1	1901.3	1690.3	1624.9	Code 531-10-1	No. 4, Mar. 17, 1958
Inorganic chemicals	96.0	123.1	389.7	383.7	380.6	412.9	Code 613	Oct. 5, 1964†
Acid, hydrofluoric	95.5	144.4	407.5	407.5	407.5	407.5	Code 613-0222	Apr. 3, 1963†
Acid, sulfuric	100.0	140.7	363.3	363.3	363.3	363.3	Code 613-0281	No. 94, May 15, 1961
Platinum	92.9	121.1	283.9	462.2	541.7	505.4	Code 1022-02-73	July 5, 1965, p. 117
Sodium carbonate	90.9	119.4	343.2	339.4	344.1	384.8	Code 613-01-03	No. 58, Oct. 12, 1959
Sodium hydroxide	95.5	136.2	366.7	301.7	317.3	500.1	Code 613-01-04	No. 94, May 15, 1961
Sodium phosphate	97.4	107.0	530.2	530.2	530.2	530.2	Code 613-0267	No. 58, Oct. 12, 1959
Organic chemicals	100.0	87.4	320.2	302.0	319.9	378.8	Code 614	Oct. 5, 1964†
Furfural	94.5	137.5	556.8	576.9	576.9	625.0	Chemical Marketing Reporter	No. 58, Oct. 12, 1959
MEK, tank-car lots	82.6	87.5	300.0	274.0	209.7	350.0	Chemical Marketing Reporter	No. 58, Oct. 12, 1959
Phenol	90.4	47.1	229.3	172.8	225.5	233.5	Code 614-0241	No. 58, Oct. 12, 1959

Itemized refining cost indexes (continued)

Operating cost (based on 1956 = 100.0):	1954	1972	1985	1986	1987	Aug. 1988	* References	Index for earlier year in Costimating and Questions on Technology issues
Operating labor cost (1956 = 100)								
Wages & benefits	88.7	210.0	642.3	651.8	663.2	680.8	Employ & Earn	No. 41, Feb. 16, 1969
Productivity	97.2	197.0	219.7	253.8	261.8	272.5	Employ & Earn	No. 41, Feb. 16, 1969
Construction labor cost (1946 = 100)								
Skilled const.	174.6	499.9	1165.0	1192.5	1228.9	1261.7	Eng. News Record	No. 55, Nov. 3, 1949
Common labor	192.1	630.6	1544.5	1584.9	1632.0	1685.4	Eng. News Record	No. 55, Nov. 3, 1949
Refinery cost	183.3	545.9	1297.6	1330.0	1370.0	1410.0	Oil & Gas J. —	May 15, 1967
Equipment or materials (1946 = 100):								
Bubble tray	161.4	324.4	824.5	817.6	841.3	888.2	Computed	July 8, 1962, p. 113
Building materials (nonmetallic)	143.6	212.4	585.3	592.9	593.6	599.8	Code 13	No. 61, Dec. 15, 1949
Brick—building	144.7	252.5	743.2	771.6	793.6	814.4	Code 1342	No. 20, Mar. 3, 1949
Brick—fireclay	193.1	322.8	928.4	932.8	933.3	961.9	Code 135	May 30, 1955†
Castings, iron	188.1	274.9	871.5	877.0	875.1	912.7	Code 1015	Apr. 1, 1963†
Clay products (structural, etc.)	159.1	342.0	610.5	636.0	656.4	675.9	Code 134	No. 20, Mar. 3, 1949
Concrete ingredients	141.1	218.4	566.3	582.5	589.4	599.3	Code 132	No. 22, March 17, 1949
Concrete products	138.5	199.6	509.4	516.6	518.1	521.8	Code 133	Oct. 2, 1967, p. 112
Electrical machinery	159.9	216.3	497.0	504.6	511.3	520.5	Code 117	May 2, 1955†
Motors and generators	157.7	211.0	601.8	603.8	613.0	648.0	Code 1173	May 2, 1955†
Switchgear	171.2	271.0	676.6	693.7	705.5	727.7	Code 1175	May 2, 1955†
Transformers	161.9	149.3	373.2	376.8	383.3	391.2	Code 1174	No. 31, May 19, 1949
Engines (combustion)	150.5	233.3	666.7	676.9	689.4	705.4	Code 1194	No. 36, June 23, 1949
Exchangers (composite)	171.7	274.3	520.0	524.7	570.2	670.1	Manufacturer	Mar. 16, 1964†
Copper base	190.7	266.7	504.3	515.6	556.4	645.0	Manufacturer	Mar. 16, 1964†
Steel	156.8	281.9	530.7	531.1	588.4	687.3	Manufacturer	Mar. 16, 1964†
Fractionating towers	151.0	278.5	677.7	674.8	683.8	734.8	Computed	June 8, 1963, p. 133
Hand tools	173.8	346.5	1008.3	1032.7	1064.3	1108.3	Code 1042	June 27, 1955†
Instruments (composite)	154.6	328.4	713.7	733.3	744.2	743.3	Computed	No. 34, June 9, 1949
Insulation (composite)	198.5	272.4	1088.8	1057.4	1070.3	1106.4	Manufacturer	July 4, 1988, p. 193†
Lumber (composite)	197.8	353.4	756.3	764.9	815.9	853.4	Code 81	No. 7, Dec. 2, 1948
Southern pine	181.2	303.9	599.3	603.8	644.7	609.9	Code 811–02	No. 7, Dec. 2, 1948
Redwood, all heart	238.0	310.6	1052.4	1024.6	1149.5	1182.3	Code 811-0332	July 5, 1965, p. 117
Machinery:								
General purpose	159.9	278.5	730.8	740.8	748.8	783.6	Code 114	Feb. 17, 1949
Construction	165.9	324.4	935.9	947.0	967.2	995.9	Code 112	Apr. 1, 1968, p. 184
Oilfield	161.9	269.1	900.1	881.2	860.1	908.5	Code 1191	Oct. 10, 1955†
Paints—prepared	159.0	231.8	545.6	552.1	557.4	582.2	Code 621	May 16, 1955†
Pipe:								
Gray iron pressure	195.0	346.9	1156.9	1179.2	1180.8	1234.9	Code 1015-0239	Jan. 3, 1983
Standard carbon	182.7	319.9	937.0	856.0	891.9	1004.9	Code 1017-0611	Jan. 3, 1983
Pumps, compressors, etc.	166.5	337.5	969.0	982.6	995.0	1035.7	Code 1141	No. 29, May 5, 1949
Steel-mill products	187.1	330.6	926.4	883.2	905.6	991.6	Code 1017	Jan. 3, 1983
Alloy bars	198.7	349.4	846.7	821.4	819.0	841.4	Code 1017-0831	Apr. 1, 1963†
Cold-rolled sheets	187.0	365.5	1023.3	952.8	991.8	1039.2	Code 1017-0711	Jan. 3, 1983
Alloy sheets	177.0	225.9	479.3	470.8	464.5	483.1	Code 1017-0733	Jan. 3, 1983
Stainless strip	169.0	221.2	479.3	487.9	495.9	541.3	Code 1017-0755	Jan. 3, 1983
Structural carbon, plates	193.4	386.7	1047.5	968.4	999.2	1143.7	Code 1017-0400	Jan. 3, 1983
Seamless carbon tubing	199.4	347.3	882.8	774.0	794.6	950.8	Code 1017-0621	Jan. 3, 1983
Welded carbon tubing	180.0	265.5	936.5	936.5	979.1	1142.4	Code 1017-0622	Jan. 3, 1983
Tanks and pressure vessels	147.3	246.4	587.8	582.6	581.2	641.5	Code 1072	No. 5, Nov. 18, 1949
Tube stills	123.0	125.3	340.5	331.0	339.0	364.1	Computed	Oct. 1, 1962†
Valves and fittings	197.0	350.9	992.9	1007.5	1017.8	1085.5	Code 1149	No. 46, Sept. 1, 1940
Nelson-Farrar Refinery (Inflation Index)	179.8	438.5	1074.4	1088.9	1121.5	1171.4	Oil & Gas J.	May 15, 1969
Nelson-Farrar Refinery Operation (1956)	88.7	118.5	406.8	369.0	371.8	371.1	Oil & Gas J.	No. 2, Mar. 3, 1958
Nelson-Farrar Refinery Process Operation (1956)	88.4	147.0	551.7	430.8	435.6	401.6	Oil & Gas J.	No. 2, Mar. 3, 1958

*Code refers to the index number of the Bureau of Statistics, U.S. Department of Labor, "Wholesale Prices." †Itemized Cost Indexes, Oil & Gas Journal.

Baker Hughes rig count

	1-25-88	1-26-87
Alabama	16	6
Alaska	11	8
Arkansas	8	5
California	56	46
Land	48	38
Offshore	8	8
Colorado	36	23
Florida	3	4
Illinois	8	3
Indiana	0	1
Kansas	39	37
Kentucky	4	2
Louisiana	178	127
N. Land	11	16
S. Inland Waters	33	20
S. Land	44	32
Offshore	90	59
Maryland	0	0
Michigan	30	27
Mississippi	15	9
Montana	10	7
Nebraska	4	5
New Mexico	48	27
New York	3	1
North Dakota	17	8
Ohio	38	37
Oklahoma	123	116
Pennsylvania	23	17
South Dakota	0	1
Texas	288	279
Offshore	18	18
Inland Waters	0	1
Dist. 1	3	2
Dist. 2	12	6
Dist. 3	29	29
Dist. 4	49	38
Dist. 5	14	8
Dist. 6	16	30
Dist. 7B	17	13
Dist. 7C	15	15
Dist. 8	53	51
Dist. 8A	32	34
Dist. 9	16	14
Dist. 10	14	20
Utah	9	5
West Virginia	8	15
Wyoming	43	18
Others, Id.-2,Mo.-1, Nv.-1,Va.-3,Wa.-1	8	3
Total U.S.	**1,026**	**837**
Cum. Avg. to Date	**1,075**	**900**
Canada	226	177
Canada-Offshore	3	1
Grand Total	**1,255**	**1,015**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	2-29-88	3-2-87
Alabama	13	7
Alaska	11	7
Arkansas	8	7
California	56	43
Land	48	35
Offshore	8	8
Colorado	28	23
Florida	0	1
Illinois	8	6
Indiana	0	2
Kansas	41	43
Kentucky	2	0
Louisiana	172	108
N. Land	15	9
S. Inland Waters	31	16
S. Land	42	36
Offshore	84	47
Maryland	0	0
Michigan	27	25
Mississippi	17	10
Montana	9	7
Nebraska	3	3
New Mexico	28	33
New York	1	1
North Dakota	16	8
Ohio	19	31
Oklahoma	145	124
Pennsylvania	22	19
South Dakota	1	0
Texas	304	250
Offshore	19	19
Inland Waters	3	0
Dist. 1	5	6
Dist. 2	12	9
Dist. 3	27	24
Dist. 4	42	32
Dist. 5	11	9
Dist. 6	26	20
Dist. 7B	11	9
Dist. 7C	19	7
Dist. 8	59	55
Dist. 8A	43	27
Dist. 9	11	14
Dist. 10	16	19
Utah	5	3
West Virginia	7	16
Wyoming	35	22
Others, Id.-2,Va.-2. Wa.-1	5	2
Total U.S.	**983**	**801**
Cum. Avg. to Date	**1.020**	**852**
Canada	348	163
Canada-Offshore	3	1
Grand Total	**1,334**	**965**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	3-28-88	3-30-87
Alabama	10	7
Alaska	12	7
Arkansas	8	8
California	58	55
Land	52	47
Offshore	6	8
Colorado	28	20
Florida	0	1
Illinois	3	2
Indiana	0	1
Kansas	45	33
Kentucky	2	0
Louisiana	165	109
N. Land	9	14
S. Inland Waters	31	17
S. Land	35	27
Offshore	90	51
Maryland	0	0
Michigan	22	14
Mississippi	17	11
Montana	8	6
Nebraska	2	2
New Mexico	24	32
New York	0	0
North Dakota	16	5
Ohio	9	6
Oklahoma	137	119
Pennsylvania	9	12
South Dakota	0	0
Texas	305	262
Offshore	15	15
Inland Waters	10	2
Dist. 1	6	4
Dist. 2	11	10
Dist. 3	33	25
Dist. 4	46	33
Dist. 5	8	9
Dist. 6	23	23
Dist. 7B	15	19
Dist. 7C	19	8
Dist. 8	57	51
Dist. 8A	35	33
Dist. 9	12	12
Dist. 10	15	18
Utah	7	3
West Virginia	5	12
Wyoming	36	21
Others, Id.-1,Nv.-3, Tn.-1,Va.-2	7	0
Total U.S.	**935**	**748**
Cum. Avg. to Date	**998**	**825**
Canada	228	130
Canada-Offshore	1	1
Grand Total	**1,164**	**879**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	4-25-88	4-27-87
Alabama	7	8
Alaska	11	7
Arkansas	5	8
California	62	54
Land	56	47
Offshore	6	7
Colorado	34	16
Florida	2	0
Illinois	3	2
Indiana	0	1
Kansas	42	46
Kentucky	5	0
Louisiana	169	104
N. Land	12	9
S. Inland Waters	29	18
S. Land	38	31
Offshore	90	46
Maryland	0	0
Michigan	17	20
Mississippi	15	12
Montana	5	4
Nebraska	1	3
New Mexico	34	23
New York	0	2
North Dakota	16	6
Ohio	5	7
Oklahoma	131	131
Pennsylvania	5	6
South Dakota	0	0
Texas	290	256
Offshore	17	16
Inland Waters	12	0
Dist. 1	5	3
Dist. 2	16	10
Dist. 3	25	32
Dist. 4	39	37
Dist. 5	9	14
Dist. 6	16	20
Dist. 7B	20	12
Dist. 7C	18	11
Dist. 8	45	44
Dist. 8A	37	34
Dist. 9	16	10
Dist. 10	15	13
Utah	7	3
West Virginia	6	8
Wyoming	30	33
Others, Id.-1,Nv.-2, Tn.-1,Va.-2	6	5
Total U.S.	**908**	**765**
Cum. Avg. to Date	**979**	**808**
Canada	84	39
Canada-Offshore	1	2
Grand Total	**993**	**806**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	5-30-88	6-1-87
Alabama	8	7
Alaska	14	7
Arkansas	4	10
California	69	61
Land	64	57
Offshore	5	4
Colorado	25	18
Florida	2	1
Illinois	3	3
Indiana	0	0
Kansas	40	41
Kentucky	4	0
Louisiana	163	106
N. Land	13	6
S. Inland Waters	32	16
S. Land	26	26
Offshore	92	58
Maryland	0	0
Michigan	21	23
Mississippi	26	13
Montana	7	4
Nebraska	3	4
New Mexico	37	25
New York	1	1
North Dakota	16	11
Ohio	6	9
Oklahoma	124	109
Pennsylvania	10	13
South Dakota	1	0
Texas	266	254
Offshore	19	19
Inland Waters	4	0
Dist. 1	8	2
Dist. 2	10	11
Dist. 3	22	28
Dist. 4	38	45
Dist. 5	7	9
Dist. 6	25	14
Dist. 7B	11	21
Dist. 7C	13	14
Dist. 8	46	44
Dist. 8A	36	30
Dist. 9	16	5
Dist. 10	11	12
Utah	6	4
West Virginia	8	7
Wyoming	36	21
Others, Id.-1,Nv.-1, Tn.-1,Va.-1,Wa.-1	5	6
Total U.S.	**905**	**758**
Cum. Avg. to Date	**959**	**798**
Canada	190	98
Canada-Offshore	4	2
Grand Total	**1,099**	**858**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	6-27-88	6-29-87
Alabama	6	8
Alaska	13	9
Arkansas	11	8
California	69	60
Land	61	54
Offshore	8	6
Colorado	21	23
Florida	2	4
Illinois	3	4
Indiana	0	0
Kansas	39	43
Kentucky	6	1
Louisiana	162	112
N. Land	16	9
S. Inland Waters	22	24
S. Land	34	23
Offshore	90	56
Maryland	0	0
Michigan	19	20
Mississippi	21	6
Montana	5	6
Nebraska	5	7
New Mexico	37	32
New York	1	1
North Dakota	17	16
Ohio	7	12
Oklahoma	127	115
Pennsylvania	16	19
South Dakota	0	2
Texas	252	256
Offshore	16	17
Inland Waters	3	1
Dist. 1	5	4
Dist. 2	8	9
Dist. 3	23	25
Dist. 4	35	41
Dist. 5	8	13
Dist. 6	22	14
Dist. 7B	9	16
Dist. 7C	16	11
Dist. 8	46	48
Dist. 8A	27	35
Dist. 9	20	7
Dist. 10	14	15
Utah	5	5
West Virginia	7	12
Wyoming	37	28
Others, Id.-1,Nv.-1,Or.-1, Tn.-1,Va.-1,Wa.-1	6	4
Total U.S.	**894**	**813**
Cum. Avg. to Date	**949**	**797**
Canada	196	144
Canada-Offshore	4	3
Grand Total	**1,094**	**960**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	7-25-88	7-27-87
Alabama	9	10
Alaska	12	9
Arkansas	16	7
California	70	55
Land	62	48
Offshore	8	7
Colorado	20	26
Florida	1	4
Illinois	3	3
Indiana	0	0
Kansas	41	56
Kentucky	6	3
Louisiana	156	152
N. Land	14	13
S. Inland Waters	25	26
S. Land	30	41
Offshore	87	72
Maryland	0	0
Michigan	24	21
Mississippi	13	13
Montana	9	8
Nebraska	3	8
New Mexico	42	37
New York	0	1
North Dakota	14	14
Ohio	9	13
Oklahoma	117	133
Pennsylvania	16	12
South Dakota	2	0
Texas	249	272
Offshore	20	19
Inland Waters	5	1
Dist. 1	6	2
Dist. 2	9	13
Dist. 3	21	27
Dist. 4	42	51
Dist. 5	10	11
Dist. 6	21	21
Dist. 7B	9	13
Dist. 7C	16	12
Dist. 8	35	52
Dist. 8A	25	31
Dist. 9	21	8
Dist. 10	9	11
Utah	7	8
West Virginia	14	11
Wyoming	42	36
Others, Id.-1,Nv.-3,Or.-2, Tn.-1,Wa.-1	8	5
Total U.S.	**903**	**917**
Cum. Avg. to Date	**944**	**811**
Canada	161	176
Canada-Offshore	3	3
Grand Total	**1,067**	**1,096**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	8-29-88	8-31-87
Alabama	17	9
Alaska	13	9
Arkansas	13	12
California	66	75
Land	58	68
Offshore	8	7
Colorado	27	23
Florida	0	3
Illinois	3	3
Indiana	0	0
Kansas	35	57
Kentucky	6	3
Louisiana	152	160
N. Land	16	15
S. Inland Waters	24	24
S. Land	30	39
Offshore	82	82
Maryland	0	0
Michigan	17	18
Mississippi	15	15
Montana	12	11
Nebraska	3	7
New Mexico	30	32
New York	1	3
North Dakota	11	16
Ohio	11	16
Oklahoma	130	159
Pennsylvania	19	20
South Dakota	1	1
Texas	275	313
Offshore	26	18
Inland Waters	2	1
Dist. 1	4	5
Dist. 2	13	16
Dist. 3	24	33
Dist. 4	39	44
Dist. 5	11	17
Dist. 6	30	30
Dist. 7B	12	11
Dist. 7C	11	24
Dist. 8	50	50
Dist. 8A	24	38
Dist. 9	17	8
Dist. 10	12	18
Utah	7	10
West Virginia	18	12
Wyoming	43	52
Others, Id.-1,Nv.-3,Or.-2, Tn.-1,Va.-2,Wa.-1	10	10
Total U.S.	**935**	**1,049**
Cum. Avg. to Date	**942**	**838**
Canada	173	204
Canada-Offshore	3	3
Grand Total	**1,111**	**1,256**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	9-26-88	9-28-87
Alabama	14	18
Alaska	14	9
Arkansas	8	4
California	60	78
Land	53	73
Offshore	7	5
Colorado	24	26
Florida	0	4
Illinois	3	3
Indiana	0	0
Kansas	38	65
Kentucky	6	2
Louisiana	148	152
N. Land	17	14
S. Inland Waters	17	20
S. Land	34	44
Offshore	80	74
Maryland	0	0
Michigan	15	23
Mississippi	16	20
Montana	10	12
Nebraska	4	9
New Mexico	37	30
New York	2	2
North Dakota	11	18
Ohio	19	16
Oklahoma	113	146
Pennsylvania	23	28
South Dakota	1	0
Texas	288	322
Offshore	30	22
Inland Waters	2	1
Dist. 1	5	5
Dist. 2	15	17
Dist. 3	25	32
Dist. 4	34	45
Dist. 5	16	11
Dist. 6	38	25
Dist. 7B	17	13
Dist. 7C	17	25
Dist. 8	39	57
Dist. 8A	23	46
Dist. 9	12	10
Dist. 10	15	13
Utah	4	8
West Virginia	20	17
Wyoming	32	73
Others, Id.-1,Nv.-1,Or.-1, Tn.-1,Va.-2,Wa.-1	7	9
Total U.S.	**917**	**1,094**
Cum. Avg. to Date	**941**	**865**
Canada	272	244
Canada-Offshore	3	2
Grand Total	**1,192**	**1,340**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	10-31-88	11-2-87
Alabama	18	17
Alaska	12	8
Arkansas	6	14
California	53	73
Land	46	68
Offshore	7	5
Colorado	38	35
Florida	1	3
Illinois	4	3
Indiana	0	0
Kansas	42	54
Kentucky	5	3
Louisiana	146	163
N. Land	13	16
S. Inland Waters	17	29
S. Land	35	37
Offshore	81	81
Maryland	0	0
Michigan	15	22
Mississippi	16	14
Montana	8	13
Nebraska	1	5
New Mexico	44	39
New York	0	4
North Dakota	11	24
Ohio	13	19
Oklahoma	107	153
Pennsylvania	26	23
South Dakota	0	0
Texas	297	348
Offshore	29	23
Inland Waters	1	5
Dist. 1	5	6
Dist. 2	17	21
Dist. 3	25	35
Dist. 4	33	39
Dist. 5	12	14
Dist. 6	45	24
Dist. 7B	9	15
Dist. 7C	21	28
Dist. 8	33	66
Dist. 8A	24	47
Dist. 9	19	7
Dist. 10	24	18
Utah	3	10
West Virginia	17	15
Wyoming	33	63
Others, Nv.-2,Or.-1, Tn.-1,Va.-2,Wa.-1	7	6
Total U.S.	**923**	**1,131**
Cum. Avg. to Date	**939**	**895**
Canada	151	326
Canada-Offshore	2	1
Grand Total	**1,076**	**1,458**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	11-28-88	11-30-87
Alabama	17	15
Alaska	11	12
Arkansas	8	15
California	50	69
Land	43	63
Offshore	7	6
Colorado	30	42
Florida	1	3
Illinois	4	4
Indiana	0	0
Kansas	43	58
Kentucky	8	6
Louisiana	165	169
N. Land	16	12
S. Inland Waters	17	33
S. Land	41	39
Offshore	91	85
Maryland	0	0
Michigan	11	20
Mississippi	13	19
Montana	8	12
Nebraska	2	8
New Mexico	36	58
New York	1	3
North Dakota	13	21
Ohio	11	26
Oklahoma	123	149
Pennsylvania	30	22
South Dakota	1	1
Texas	272	340
Offshore	28	21
Inland Waters	0	2
Dist. 1	2	6
Dist. 2	13	19
Dist. 3	24	34
Dist. 4	32	38
Dist. 5	11	14
Dist. 6	40	24
Dist. 7B	10	12
Dist. 7C	17	24
Dist. 8	45	70
Dist. 8A	22	47
Dist. 9	16	8
Dist. 10	12	21
Utah	4	10
West Virginia	16	13
Wyoming	25	58
Others, Nv.-3,Or.-1, Tn.-1,Va.-2,Wa.-1	8	8
Total U.S.	**911**	**1,161**
Cum. Avg. to Date	**937**	**917**
Canada	107	209
Canada-Offshore	2	3
Grand Total	**1,020**	**1,373**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Baker Hughes rig count

	12-26-88	12-28-87
Alabama	11	20
Alaska	12	12
Arkansas	3	16
California	49	62
Land	42	55
Offshore	7	7
Colorado	27	40
Florida	2	6
Illinois	4	6
Indiana	0	0
Kansas	44	47
Kentucky	9	5
Louisiana	164	184
N. Land	17	10
S. Inland Waters	15	34
S. Land	41	49
Offshore	91	91
Maryland	0	0
Michigan	10	20
Mississippi	26	18
Montana	6	8
Nebraska	2	4
New Mexico	36	53
New York	1	5
North Dakota	9	21
Ohio	23	30
Oklahoma	137	142
Pennsylvania	31	21
South Dakota	1	2
Texas	268	335
Offshore	21	18
Inland Waters	1	1
Dist. 1	2	0
Dist. 2	11	13
Dist. 3	36	29
Dist. 4	41	40
Dist. 5	9	14
Dist. 6	30	28
Dist. 7B	7	17
Dist. 7C	15	25
Dist. 8	35	77
Dist. 8A	21	42
Dist. 9	22	12
Dist. 10	17	19
Utah	3	15
West Virginia	18	14
Wyoming	36	52
Others, Nv.-3,Tn.-1, Va.-2,Wa.-2	8	7
Total U.S.	**940**	**1,145**
Cum. Avg. to Date	**936**	**935**
Canada	118	166
Canada-Offshore	2	2
Grand Total	**1,060**	**1,333**

Source: Baker Hughes Inc.
Data available in Oil & Gas Journal Energy Database.

Rotary rigs from spudding in to total depth

Smith rig count

	12-30-88		1-1-88	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	14	50.0	29	37.9
2,501- 5,000	163	87.1	199	82.4
5,001- 7,500	176	82.4	222	77.0
7,501-10,000	240	63.7	275	66.2
10,001-12,500	175	39.4	223	49.3
12,501-15,000	102	33.3	166	33.7
15,001-17,500	58	27.6	81	29.6
17,501-20,000	30	40.0	39	33.3
20,001-over	9	11.1	9	—
Total	**967**	**59.9**	**1,243**	**58.8**
INLAND	21		31	
LAND	827		1,059	
OFFSHORE	119		153	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	1-29-88		1-30-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	24	29.2	22	31.8
2,501- 5,000	187	78.1	181	91.2
5,001- 7,500	203	76.4	167	80.2
7,501-10,000	225	66.7	199	64.3
10,001-12,500	190	46.7	186	50.0
12,501-15,000	136	27.9	94	33.0
15,001-17,500	78	28.2	57	36.8
17,501-20,000	39	30.8	24	33.3
20,001-over	8	—	8	12.5
Total	**1,090**	**56.8**	**938**	**62.7**
INLAND	27		21	
LAND	927		840	
OFFSHORE	136		77	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	2-26-88		2-27-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	36	30.6	15	26.7
2,501- 5,000	184	82.6	151	88.1
5,001- 7,500	201	75.1	142	75.4
7,501-10,000	231	56.7	186	66.1
10,001-12,500	176	44.9	155	42.6
12,501-15,000	121	27.3	90	34.4
15,001-17,500	95	28.4	60	38.3
17,501-20,000	33	30.3	24	33.3
20,001-over	9	—	7	14.3
Total	**1,086**	**54.7**	**830**	**59.8**
INLAND	28		16	
LAND	917		732	
OFFSHORE	141		82	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	3-25-88		3-27-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	40	35.0	17	41.2
2,501- 5,000	160	83.1	120	85.0
5,001- 7,500	181	75.1	178	80.9
7,501-10,000	243	59.3	189	61.9
10,001-12,500	182	42.9	150	47.3
12,501-15,000	126	31.7	83	36.1
15,001-17,500	87	23.0	48	37.5
17,501-20,000	34	32.4	22	13.6
20,001-over	8	12.5	9	11.1
Total	**1,061**	**54.4**	**816**	**60.4**
INLAND	31		21	
LAND	899		718	
OFFSHORE	131		77	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	4-29-88		5-1-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	38	34.2	30	33.3
2,501- 5,000	154	77.3	162	87.0
5,001- 7,500	174	72.4	180	77.2
7,501-10,000	225	63.6	198	61.1
10,001-12,500	177	39.0	149	53.7
12,501-15,000	122	40.2	90	41.1
15,001-17,500	83	15.7	42	40.5
17,501-20,000	36	33.3	25	8.0
20,001-over	8	—	10	20.0
Total	**1,017**	**53.5**	**886**	**62.0**
INLAND	28		23	
LAND	854		788	
OFFSHORE	135		75	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	5-27-88		5-29-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	36	27.8	27	33.3
2,501- 5,000	158	79.7	142	88.0
5,001- 7,500	178	74.2	161	75.2
7,501-10,000	221	57.0	205	54.6
10,001-12,500	181	38.1	142	50.0
12,501-15,000	127	33.1	98	43.9
15,001-17,500	70	12.9	48	33.3
17,501-20,000	35	28.6	26	3.8
20,001-over	9	—	6	—
Total	**1,015**	**51.6**	**855**	**58.2**
INLAND	27		18	
LAND	861		745	
OFFSHORE	127		92	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	6-24-88		6-26-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	37	51.4	37	45.9
2,501- 5,000	175	78.3	188	86.2
5,001- 7,500	193	71.5	182	80.2
7,501-10,000	242	60.3	243	60.9
10,001-12,500	184	37.0	142	45.1
12,501-15,000	124	33.9	106	38.7
15,001-17,500	66	15.2	46	28.3
17,501-20,000	33	27.3	26	11.5
20,001-over	8	12.5	4	—
Total	**1,062**	**53.7**	**974**	**61.0**
INLAND	21		25	
LAND	903		847	
OFFSHORE	138		102	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	7-29-88		7-31-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	29	41.4	32	40.6
2,501- 5,000	169	82.8	224	85.3
5,001- 7,500	201	74.1	202	76.2
7,501-10,000	221	56.1	261	60.9
10,001-12,500	214	34.1	168	47.6
12,501-15,000	105	31.4	127	40.2
15,001-17,500	71	19.7	64	32.8
17,501-20,000	26	26.9	34	17.6
20,001-over	10	10.0	5	—
Total	**1,046**	**52.9**	**1,117**	**60.4**
INLAND	24		35	
LAND	879		977	
OFFSHORE	143		105	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	8-26-88		8-28-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	28	53.6	37	45.9
2,501- 5,000	177	83.6	208	82.7
5,001- 7,500	211	70.6	238	75.6
7,501-10,000	234	62.4	280	61.4
10,001-12,500	199	33.7	185	44.3
12,501-15,000	106	33.0	130	33.1
15,001-17,500	64	29.7	72	34.7
17,501-20,000	26	19.2	37	13.5
20,001-over	7	14.3	5	—
Total	**1,052**	**55.6**	**1,192**	**58.4**
INLAND	25		30	
LAND	894		1,048	
OFFSHORE	133		114	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	9-30-88		10-2-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	28	46.4	43	41.9
2,501- 5,000	172	86.0	253	84.2
5,001- 7,500	182	73.6	265	76.6
7,501-10,000	244	66.4	277	67.1
10,001-12,500	195	42.6	199	50.3
12,501-15,000	106	35.8	142	34.5
15,001-17,500	68	26.5	88	29.5
17,501-20,000	26	26.9	35	17.1
20,001-over	6	16.7	9	—
Total	**1,027**	**58.8**	**1,311**	**61.1**
INLAND	15		30	
LAND	879		1,150	
OFFSHORE	133		131	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	10-28-88		10-30-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	34	64.7	33	24.2
2,501- 5,000	166	87.3	228	83.8
5,001- 7,500	176	80.1	288	74.7
7,501-10,000	249	64.7	278	62.6
10,001-12,500	178	41.6	231	52.4
12,501-15,000	105	35.2	160	38.7
15,001-17,500	68	30.9	90	28.9
17,501-20,000	27	33.3	35	31.4
20,001-over	7	14.3	8	—
Total	**1,010**	**60.5**	**1,351**	**59.8**
INLAND	12		30	
LAND	873		1,184	
OFFSHORE	125		137	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

Smith rig count

	11-25-88		11-27-87	
Proposed depth (feet)	Rig count	% footage*	Rig count	% footage*
0- 2,500	25	48.0	26	42.3
2,501- 5,000	141	90.8	233	83.7
5,001- 7,500	169	82.8	244	72.5
7,501-10,000	240	62.5	300	65.0
10,001-12,500	179	36.3	222	46.4
12,501-15,000	97	32.0	156	32.1
15,001-17,500	62	29.0	75	29.3
17,501-20,000	27	37.0	39	30.8
20,001-over	9	11.1	9	—
Total	**949**	**58.5**	**1,304**	**58.7**
INLAND	22		29	
LAND	801		1,124	
OFFSHORE	126		151	

* Rigs employed under footage contracts.
Definitions, see OGJ 3/19/84, p. 138.
Source: Smith International Inc.
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	1-29-88*	1-30-87†		1-29-88*	1-30-87†
Alabama	58	56	Montana	67	68
Alaska	2,025	2,017	New Mexico	193	196
California	1,099	1,060	North Dakota	112	118
Colorado	75	76	Oklahoma	360	348
Florida	22	23	Texas	2,071	2,183
Illinois	65	65	Utah	94	103
Kansas	165	163	Wyoming	300	321
Louisiana	1,292	1,357	All others	161	149
Michigan	65	65	**Total**	**8,301**	**8,446**
Mississippi	77	78			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	3-25-88*	3-27-87†		3-25-88*	3-27-87†
Alabama	52	58	Montana	67	70
Alaska	2,082	1,945	New Mexico	203	196
California	1,096	1,073	North Dakota	110	117
Colorado	75	76	Oklahoma	365	387
Florida	21	23	Texas	2,062	2,186
Illinois	63	67	Utah	93	94
Kansas	163	154	Wyoming	300	297
Louisiana	1,280	1,308	All others	160	148
Michigan	63	63	**Total**	**8,333**	**8,340**
Mississippi	78	78			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	5-27-88*	5-29-87†		5-27-88*	5-29-87†
Alabama	59	57	Montana	67	69
Alaska	2,085	1,979	New Mexico	198	193
California	1,095	1,084	North Dakota	109	114
Colorado	76	77	Oklahoma	348	354
Florida	22	24	Texas	2,120	2,129
Illinois	64	64	Utah	94	99
Kansas	159	165	Wyoming	305	310
Louisiana	1,232	1,327	All others	153	142
Michigan	64	65	**Total**	**8,326**	**8,330**
Mississippi	76	78			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	7-29-88*	7-31-87†		7-29-88*	7-31-87†
Alabama	59	58	Montana	65	67
Alaska	1,990	1,910	New Mexico	198	196
California	1,081	1,091	North Dakota	109	113
Colorado	76	80	Oklahoma	350	368
Florida	21	23	Texas	2,127	2,106
Illinois	66	66	Utah	94	99
Kansas	160	168	Wyoming	310	311
Louisiana	1,225	1,298	All others	150	147
Michigan	68	71	**Total**	**8,224**	**8,251**
Mississippi	75	79			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	9-30-88*	10-2-87†		9-30-88*	10-2-87†
Alabama	52	56	Montana	62	67
Alaska	1,987	1,874	New Mexico	194	201
California	1,073	1,083	North Dakota	109	111
Colorado	82	81	Oklahoma	357	366
Florida	21	23	Texas	2,085	2,106
Illinois	65	66	Utah	92	100
Kansas	164	167	Wyoming	310	309
Louisiana	1,198	1,300	All others	143	149
Michigan	66	71	**Total**	**8,133**	**8,205**
Mississippi	73	75			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	11-25-88*	11-27-87†		11-25-88*	11-27-87†
Alabama	57	57	Montana	63	69
Alaska	2,010	2,068	New Mexico	193	200
California	1,066	1,095	North Dakota	107	110
Colorado	84	77	Oklahoma	353	360
Florida	22	23	Texas	2,045	2,122
Illinois	64	63	Utah	93	96
Kansas	164	159	Wyoming	310	318
Louisiana	1,155	1,290	All others	143	145
Michigan	65	70	**Total**	**8,068**	**8,397**
Mississippi	74	75			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d).

	2-26-88*	2-27-87†		2-26-88*	2-27-87†
Alabama	58	56	Montana	68	70
Alaska	2,100	1,853	New Mexico	201	196
California	1,100	1,078	North Dakota	110	118
Colorado	75	76	Oklahoma	365	377
Florida	24	21	Texas	2,062	2,193
Illinois	65	68	Utah	93	101
Kansas	166	161	Wyoming	300	315
Louisiana	1,286	1,343	All others	160	153
Michigan	65	65	**Total**	**8,377**	**8,322**
Mississippi	79	78			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	4-29-88*	5-1-87†		4-29-88*	5-1-87†
Alabama	52	56	Montana	66	68
Alaska	2,072	1,990	New Mexico	202	194
California	1,096	1,085	North Dakota	110	117
Colorado	75	77	Oklahoma	352	377
Florida	21	23	Texas	2,062	2,174
Illinois	61	66	Utah	93	97
Kansas	155	166	Wyoming	300	306
Louisiana	1,260	1,298	All others	153	158
Michigan	63	65	**Total**	**8,271**	**8,395**
Mississippi	78	78			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	6-24-88*	6-26-87†		6-24-88*	6-26-87†
Alabama	59	58	Montana	67	68
Alaska	2,082	1,940	New Mexico	198	191
California	1,096	1,088	North Dakota	108	113
Colorado	76	76	Oklahoma	344	360
Florida	22	22	Texas	2,120	2,115
Illinois	65	66	Utah	94	97
Kansas	160	163	Wyoming	305	294
Louisiana	1,227	1,308	All others	152	148
Michigan	64	65	**Total**	**8,315**	**8,250**
Mississippi	76	78			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	8-26-88*	8-28-87†		8-26-88*	8-28-87†
Alabama	52	57	Montana	66	68
Alaska	1,965	1,908	New Mexico	190	198
California	1,072	1,095	North Dakota	110	109
Colorado	82	80	Oklahoma	360	361
Florida	22	23	Texas	2,100	2,097
Illinois	65	65	Utah	94	95
Kansas	164	160	Wyoming	310	313
Louisiana	1,205	1,294	All others	145	141
Michigan	68	71	**Total**	**8,145**	**8,210**
Mississippi	75	75			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	10-28-88*	10-30-87†		10-28-88*	10-30-87†
Alabama	59	51	Montana	64	68
Alaska	1,998	1,986	New Mexico	190	203
California	1,070	1,097	North Dakota	109	110
Colorado	84	80	Oklahoma	355	375
Florida	22	23	Texas	2,065	2,121
Illinois	65	65	Utah	93	99
Kansas	163	164	Wyoming	310	317
Louisiana	1,185	1,310	All others	143	149
Michigan	65	70	**Total**	**8,112**	**8,364**
Mississippi	72	76			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

OGJ production report

Crude oil and lease condensate
(1,000 b/d)

	12-30-88*	1-1-88†		12-30-88*	1-1-88†
Alabama	57	57	Montana	63	67
Alaska	2,012	2,043	New Mexico	193	199
California	1,063	1,078	North Dakota	107	110
Colorado	84	81	Oklahoma	345	348
Florida	22	23	Texas	2,015	2,106
Illinois	63	68	Utah	93	94
Kansas	159	162	Wyoming	310	318
Louisiana	1,148	1,269	All others	142	150
Michigan	65	69	**Total**	**8,015**	**8,318**
Mississippi	74	76			

*OGJ estimate †Revised

Source: Oil & Gas Journal
Data available in Oil & Gas Journal Energy Database.

API refinery report—January 29, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,453	1,215	1,220	1,400	87.1	688	78	610	15	70	336	213
App. Dist. 1	107	100	100	105	95.2	36	11	25	—	—	30	5
Dist. 1 total	**1,560**	**1,315**	**1,320**	**1,505**	**87.7**	**724**	**89**	**635**	**15**	**70**	**366**	**218**
Ind., Ill., Ky.	2,051	1,867	1,883	2,220	84.8	1,157	175	982	7	120	450	66
Minn., Wis., Dak.	300	287	287	317	90.5	133	30	103	1	21	71	6
Okla., Kan., Mo.	655	621	625	720	86.8	357	118	239	11	29	172	4
Dist. 2 total	**3,006**	**2,775**	**2,795**	**3,257**	**85.8**	**1,647**	**323**	**1,324**	**19**	**170**	**693**	**76**
Inland Texas	453	403	413	569	72.6	248	63	185	27	37	87	18
Texas Gulf coast	3,366	2,989	3,046	3,569	85.3	1,582	217	1,365	24	348	787	197
La. Gulf Coast	2,454	2,391	2,395	2,648	90.4	1,124	227	897	38	302	537	108
N. La. and Ark.	189	181	184	257	71.6	48	7	41	9	2	57	10
New Mexico	91	71	71	81	87.7	43	19	24	9	2	15	—
Dist. 3 total	**6,553**	**6,035**	**6,109**	**7,124**	**85.8**	**3,045**	**533**	**2,512**	**107**	**691**	**1,483**	**333**
Dist. 4 total	**446**	**429**	**430**	**552**	**77.9**	**206**	**71**	**135**	**7**	**29**	**102**	**9**
Dist. 5 total	**2,664**	**2,544**	**2,544**	**3,259**	**78.1**	**1,127**	**281**	**846**	**51**	**342**	**394**	**378**
January 29, 1988	**14,229**	**13,096**	**13,198**	**15,697**	**84.1**	**6,749**	**1,297**	**5,452**	**199**	**1,302**	**3,038**	**1,014**
January 22, 1988†	**14,337**	**12,943**	**13,086**	**15,697**	**83.4**	**6,774**	**1,309**	**5,465**	**210**	**1,272**	**2,993**	**997**
January 30, 1987	**13,488**	**12,309**	**12,527**	**15,594**	**80.3**	**6,508**	**1,807**	**4,701**	**209**	**1,130**	**2,760**	**885**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—February 26, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,409	1,219	1,224	1,400	87.4	674	71	603	19	77	285	170
App. Dist. 1	113	106	106	105	101.0	39	15	24	—	—	35	4
Dist. 1 total	**1,522**	**1,325**	**1,330**	**1,505**	**88.4**	**713**	**86**	**627**	**19**	**77**	**320**	**174**
Ind., Ill., Ky.	1,956	1,794	1,802	2,220	81.2	1,096	183	913	1	98	364	65
Minn., Wis., Dak.	296	283	284	317	89.6	167	44	123	—	20	68	7
Okla., Kan., Mo.	722	613	618	720	85.8	368	87	281	9	45	158	4
Dist. 2 total	**2,974**	**2,690**	**2,704**	**3,257**	**83.0**	**1,631**	**314**	**1,317**	**10**	**163**	**590**	**76**
Inland Texas	564	487	487	569	85.6	292	72	220	26	33	111	13
Texas Gulf coast	3,001	2,726	2,782	3,569	77.9	1,390	217	1,173	29	283	512	163
La. Gulf Coast	2,592	2,331	2,314	2,648	87.4	1,126	178	948	12	298	451	106
N. La. and Ark.	189	178	180	257	70.0	62	11	51	5	3	53	10
New Mexico	88	69	70	81	86.4	43	18	25	9	1	13	1
Dist. 3 total	**6,434**	**5,791**	**5,833**	**7,124**	**81.9**	**2,913**	**496**	**2,417**	**81**	**618**	**1,140**	**293**
Dist. 4 total	**456**	**422**	**423**	**552**	**76.6**	**211**	**69**	**142**	**9**	**19**	**101**	**12**
Dist. 5 total	**2,725**	**2,448**	**2,469**	**3,259**	**75.8**	**1,113**	**239**	**874**	**72**	**320**	**376**	**415**
February 26, 1988	**14,111**	**12,676**	**12,759**	**15,697**	**81.3**	**6,581**	**1,204**	**5,377**	**191**	**1,197**	**2,527**	**970**
February 19, 1988†	**14,040**	**12,695**	**12,781**	**15,697**	**81.4**	**6,734**	**1,178**	**5,556**	**203**	**1,129**	**2,641**	**952**
February 27, 1987	**13,073**	**12,038**	**12,173**	**15,594**	**78.1**	**6,554**	**1,657**	**4,897**	**177**	**1,080**	**2,511**	**845**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—March 25, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Total	Leaded*	Unleaded*	Naphtha	Kero	Distillate	Residual
East coast	1,371	1,148	1,148	1,400	82.0	731	105	626	21	82	268	86
App. Dist. 1	102	100	100	105	95.2	45	6	39	—	—	35	3
Dist. 1 total	**1,473**	**1,248**	**1,248**	**1,505**	**82.9**	**776**	**111**	**665**	**21**	**82**	**303**	**89**
Ind., Ill., Ky.	2,062	1,988	2,030	2,220	91.4	1,107	150	957	13	139	367	43
Minn., Wis., Dak.	305	300	300	317	94.6	152	41	111	—	6	92	4
Okla., Kan., Mo.	721	632	636	720	88.3	410	139	271	11	47	155	2
Dist. 2 total	**3,088**	**2,920**	**2,966**	**3,257**	**91.1**	**1,669**	**330**	**1,339**	**24**	**192**	**614**	**49**
Inland Texas	566	501	500	569	87.9	277	70	207	34	36	124	15
Texas Gulf coast	3,368	3,003	3,106	3,569	87.0	1,567	265	1,302	65	262	618	202
La. Gulf Coast	2,519	2,373	2,405	2,648	90.8	1,035	231	804	31	280	469	85
N. La. and Ark.	173	156	159	257	61.9	58	12	46	8	6	50	8
New Mexico	81	66	66	81	81.5	44	18	26	10	1	15	—
Dist. 3 total	**6,707**	**6,099**	**6,236**	**7,124**	**87.5**	**2,981**	**596**	**2,385**	**148**	**585**	**1,276**	**310**
Dist. 4 total	**457**	**402**	**404**	**552**	**73.2**	**240**	**90**	**150**	**10**	**26**	**107**	**8**
Dist. 5 total	**2,670**	**2,549**	**2,565**	**3,259**	**78.7**	**1,152**	**279**	**873**	**40**	**334**	**444**	**374**
March 25, 1988	**14,395**	**13,218**	**13,419**	**15,697**	**85.5**	**6,818**	**1,406**	**5,412**	**243**	**1,219**	**2,744**	**830**
March 18, 1988†	**14,633**	**13,049**	**13,227**	**15,697**	**84.3**	**6,766**	**1,316**	**5,450**	**239**	**1,289**	**2,731**	**920**
March 27, 1987	**13,416**	**12,172**	**12,205**	**15,594**	**78.3**	**6,423**	**1,504**	**4,919**	**188**	**1,117**	**2,388**	**946**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—April 29, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,165	952	954	1,400	68.1	625	61	564	23	80	250	144
App. Dist. 1	53	48	48	105	45.7	21	2	19	—	—	15	2
Dist. 1 total	**1,218**	**1,000**	**1,002**	**1,505**	**66.6**	**646**	**63**	**583**	**23**	**80**	**265**	**146**
Ind., Ill., Ky.	2,092	1,890	1,908	2,220	85.9	1,191	147	1,044	11	123	378	56
Minn., Wis., Dak.	308	299	299	387	77.3	161	48	113	—	13	74	8
Okla., Kan., Mo.	750	678	690	720	95.8	394	150	244	10	31	206	7
Dist. 2 total	**3,150**	**2,867**	**2,897**	**3,327**	**87.1**	**1,746**	**345**	**1,401**	**21**	**167**	**658**	**71**
Inland Texas	594	499	506	569	88.9	290	92	198	28	34	123	14
Texas Gulf coast	3,717	3,105	3,306	3,569	92.6	1,727	337	1,390	39	284	702	261
La. Gulf Coast	2,494	2,234	2,273	2,949	77.1	1,188	243	945	18	228	453	153
N. La. and Ark.	186	175	178	257	69.3	60	16	44	5	4	48	9
New Mexico	78	67	67	81	82.7	37	13	24	6	3	15	—
Dist. 3 total	**7,069**	**6,080**	**6,330**	**7,425**	**85.3**	**3,302**	**701**	**2,601**	**96**	**553**	**1,341**	**437**
Dist. 4 total	**513**	**437**	**439**	**552**	**79.5**	**224**	**72**	**152**	**12**	**25**	**126**	**13**
Dist. 5 total	**2,810**	**2,748**	**2,775**	**3,207**	**86.5**	**1,286**	**355**	**931**	**56**	**296**	**470**	**404**
April 29, 1988	**14,760**	**13,132**	**13,443**	**16,016**	**83.9**	**7,204**	**1,536**	**5,668**	**208**	**1,121**	**2,860**	**1,071**
April 22, 1988†	**14,453**	**13,250**	**13,431**	**16,916**	**83.9**	**6,946**	**1,287**	**5,659**	**197**	**1,149**	**2,972**	**1,041**
May 1, 1987	**13,281**	**12,253**	**12,341**	**15,621**	**79.0**	**6,905**	**1,603**	**5,302**	**190**	**1,076**	**2,422**	**833**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—May 27, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,451	1,131	1,135	1,400	81.1	671	71	600	5	61	222	141
App. Dist. 1	108	103	104	105	99.0	38	8	30	—	—	33	2
Dist. 1 total	**1,559**	**1,234**	**1,239**	**1,505**	**82.3**	**709**	**79**	**630**	**5**	**61**	**255**	**143**
Ind., Ill., Ky.	2,143	2,046	2,046	2,220	92.2	1,184	160	1,024	16	113	449	52
Minn., Wis., Dak.	305	302	302	387	78.0	145	14	131	1	20	76	9
Okla., Kan., Mo.	780	703	703	720	97.6	363	79	284	11	49	197	2
Dist. 2 total	**3,228**	**3,051**	**3,051**	**3,327**	**91.7**	**1,692**	**253**	**1,439**	**28**	**182**	**722**	**63**
Inland Texas	551	478	478	569	84.0	277	73	204	42	19	100	17
Texas Gulf coast	3,597	3,152	3,255	3,569	91.2	1,786	258	1,528	10	252	644	222
La. Gulf Coast	2,433	2,238	2,288	2,949	77.6	1,146	219	927	15	204	494	106
N. La. and Ark.	194	184	187	257	72.8	57	18	39	6	4	56	8
New Mexico	79	64	68	81	84.0	41	11	30	9	2	16	—
Dist. 3 total	**6,854**	**6,116**	**6,276**	**7,425**	**84.5**	**3,307**	**579**	**2,728**	**82**	**481**	**1,310**	**353**
Dist. 4 total	**493**	**494**	**497**	**552**	**90.0**	**227**	**72**	**155**	**11**	**26**	**137**	**15**
Dist. 5 total	**2,668**	**2,639**	**2,668**	**3,207**	**83.2**	**1,110**	**242**	**868**	**42**	**327**	**449**	**340**
May 20, 1988	**14,802**	**13,534**	**13,731**	**16,016**	**85.7**	**7,045**	**1,225**	**5,820**	**168**	**1,077**	**2,873**	**914**
May 20, 1988†	**14,798**	**13,434**	**13,652**	**16,016**	**85.2**	**6,761**	**1,386**	**5,375**	**219**	**1,030**	**2,923**	**942**
May 29, 1987	**14,016**	**12,965**	**13,118**	**15,621**	**84.0**	**7,055**	**1,883**	**5,172**	**206**	**1,078**	**2,634**	**925**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—June 24, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,492	1,228	1,236	1,400	88.3	669	75	594	20	84	278	112
App. Dist. 1	104	102	103	105	98.1	36	8	28	—	—	33	3
Dist. 1 total	**1,596**	**1,330**	**1,339**	**1,505**	**89.0**	**705**	**83**	**622**	**20**	**84**	**311**	**115**
Ind., Ill., Ky.	2,034	1,968	1,968	2,220	88.6	1,109	186	923	18	107	418	59
Minn., Wis., Dak.	316	315	315	387	81.4	166	55	111	2	15	78	10
Okla., Kan., Mo.	768	717	717	720	99.6	399	142	257	7	31	185	1
Dist. 2 total	**3,118**	**3,000**	**3,000**	**3,327**	**90.2**	**1,674**	**383**	**1,291**	**27**	**153**	**681**	**70**
Inland Texas	576	504	509	569	89.5	283	78	205	26	38	117	15
Texas Gulf coast	3,560	3,116	3,205	3,569	89.8	1,665	301	1,364	22	289	608	137
La. Gulf Coast	2,233	2,145	2,203	2,949	74.7	1,192	230	962	12	238	444	146
N. La. and Ark.	203	190	193	257	75.1	59	12	47	6	6	55	9
New Mexico	85	67	70	81	86.4	40	13	27	10	1	18	—
Dist. 3 total	**6,657**	**6,022**	**6,180**	**7,425**	**83.2**	**3,239**	**634**	**2,605**	**76**	**572**	**1,242**	**307**
Dist. 4 total	**514**	**490**	**492**	**552**	**89.1**	**262**	**94**	**168**	**10**	**24**	**134**	**11**
Dist. 5 total	**2,824**	**2,763**	**2,786**	**3,207**	**86.9**	**1,164**	**290**	**874**	**37**	**337**	**408**	**397**
June 24, 1988	**14,709**	**13,605**	**13,797**	**16,016**	**86.1**	**7,044**	**1,484**	**5,560**	**170**	**1,170**	**2,776**	**900**
June 17, 1988†	**14,720**	**13,350**	**13,585**	**16,016**	**84.8**	**6,987**	**1,366**	**5,621**	**196**	**1,134**	**2,826**	**838**
June 26, 1987	**14,637**	**13,345**	**13,429**	**15,621**	**86.0**	**7,277**	**1,880**	**5,397**	**183**	**1,004**	**2,863**	**871**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—July 29, 1988

District	Refinery operations (Thousands of barrels daily) Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Refinery output (Thousands of barrels daily) Motor gasoline Total	Leaded*	Unleaded*	Jet fuel Naphtha	Kero	Fuel oils Distillate	Residual
East coast	1,537	1,261	1,265	1,380	91.7	648	32	616	37	93	317	133
App. Dist. 1	106	98	100	107	93.5	39	8	31	—	—	32	2
Dist. 1 total	**1,643**	**1,359**	**1,365**	**1,487**	**91.8**	**687**	**40**	**647**	**37**	**93**	**349**	**135**
Ind., Ill., Ky.	2,058	2,007	2,021	2,254	89.7	1,165	156	1,009	2	119	392	66
Minn., Wis., Dak.	346	342	342	312	109.6	170	27	143	2	13	94	8
Okla., Kan., Mo.	739	719	722	718	100.6	405	111	294	11	42	199	6
Dist. 2 total	**3,143**	**3,068**	**3,085**	**3,284**	**93.9**	**1,740**	**294**	**1,446**	**15**	**174**	**685**	**80**
Inland Texas	565	508	514	564	91.1	294	87	207	25	31	118	14
Texas Gulf coast	3,455	3,108	3,118	3,580	87.1	1,655	222	1,433	20	209	627	138
La. Gulf Coast	2,384	2,202	2,259	2,908	77.7	1,242	186	1,056	27	231	443	139
N. La. and Ark.	209	201	203	252	80.6	61	19	42	8	5	56	10
New Mexico	81	73	73	76	96.1	41	13	28	10	1	17	—
Dist. 3 total	**6,694**	**6,092**	**6,167**	**7,380**	**83.6**	**3,293**	**527**	**2,766**	**90**	**477**	**1,261**	**301**
Dist. 4 total	**506**	**501**	**510**	**535**	**95.3**	**257**	**88**	**169**	**12**	**32**	**107**	**10**
Dist. 5 total	**2,802**	**2,779**	**2,802**	**3,231**	**86.7**	**1,252**	**333**	**919**	**61**	**342**	**421**	**348**
July 29, 1988	**14,788**	**13,799**	**13,929**	**15,917**	**87.5**	**7,229**	**1,282**	**5,947**	**215**	**1,118**	**2,823**	**874**
July 22, 1988†	**14,671**	**13,778**	**13,897**	**15,917**	**87.3**	**7,165**	**1,292**	**5,873**	**227**	**1,062**	**2,820**	**857**
July 31, 1987	**14,804**	**13,443**	**13,507**	**15,692**	**86.1**	**6,898**	**1,705**	**5,193**	**268**	**1,122**	**2,726**	**839**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—August 26, 1988

District	Refinery operations (Thousands of barrels daily) Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Refinery output (Thousands of barrels daily) Motor gasoline Total	Leaded*	Unleaded*	Jet fuel Naphtha	Kero	Fuel oils Distillate	Residual
East coast	1,571	1,337	1,337	1,380	96.9	690	73	617	26	86	356	146
App. Dist. 1	111	103	103	107	96.3	43	9	34	—	—	37	2
Dist. 1 total	**1,682**	**1,440**	**1,440**	**1,487**	**96.8**	**733**	**82**	**651**	**26**	**86**	**393**	**148**
Ind., Ill., Ky.	2,077	2,034	2,055	2,254	91.2	1,182	154	1,028	10	118	412	42
Minn., Wis., Dak.	336	332	333	312	106.7	170	36	134	—	18	82	8
Okla., Kan., Mo.	761	712	716	718	99.7	428	87	341	8	31	187	8
Dist. 2 total	**3,174**	**3,078**	**3,104**	**3,284**	**94.5**	**1,780**	**277**	**1,503**	**18**	**167**	**681**	**58**
Inland Texas	536	493	496	564	87.9	324	88	236	20	37	117	14
Texas Gulf coast	3,516	3,150	3,159	3,580	88.2	1,627	197	1,430	13	273	602	154
La. Gulf Coast	2,408	2,235	2,278	2,908	78.3	1,185	233	952	31	233	492	99
N. La. and Ark.	218	208	208	252	82.5	54	3	51	6	9	49	9
New Mexico	88	75	75	76	98.7	42	14	28	11	1	18	1
Dist. 3 total	**6,766**	**6,161**	**6,216**	**7,380**	**84.2**	**3,232**	**535**	**2,697**	**81**	**553**	**1,278**	**277**
Dist. 4 total	**526**	**504**	**510**	**535**	**95.3**	**274**	**102**	**172**	**13**	**32**	**116**	**11**
Dist. 5 total	**2,841**	**2,663**	**2,736**	**3,231**	**84.7**	**1,252**	**330**	**922**	**49**	**303**	**451**	**361**
August 26, 1988	**14,989**	**13,846**	**14,006**	**15,917**	**88.0**	**7,271**	**1,326**	**5,945**	**187**	**1,141**	**2,919**	**855**
August 19, 1988†	**14,634**	**13,741**	**13,872**	**15,917**	**87.2**	**7,041**	**1,199**	**5,842**	**234**	**1,120**	**2,880**	**840**
August 28, 1987	**14,533**	**13,406**	**13,505**	**15,692**	**86.1**	**7,071**	**1,770**	**5,301**	**234**	**1,232**	**2,665**	**933**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—September 30, 1988

District	Refinery operations (Thousands of barrels daily) Total refinery input	Crude runs	Input to crude stills	Operable capacity	% operated	Refinery output (Thousands of barrels daily) Motor gasoline Total	Leaded*	Unleaded*	Jet fuel Naphtha	Kero	Fuel oils Distillate	Residual
East coast	1,475	1,245	1,253	1,380	90.8	663	35	628	17	76	356	148
App. Dist. 1	95	90	91	107	85.0	40	8	32	—	—	29	2
Dist. 1 total	**1,570**	**1,335**	**1,344**	**1,487**	**90.4**	**703**	**43**	**660**	**17**	**76**	**385**	**150**
Ind., Ill., Ky.	1,925	1,823	1,837	2,254	81.5	1,062	114	948	10	95	400	43
Minn., Wis., Dak.	343	333	337	312	108.0	149	35	114	1	19	53	7
Okla., Kan., Mo.	754	703	711	718	99.0	367	111	256	9	56	178	6
Dist. 2 total	**3,022**	**2,859**	**2,885**	**3,284**	**87.9**	**1,578**	**260**	**1,318**	**20**	**170**	**631**	**56**
Inland Texas	494	454	458	564	81.2	318	77	241	22	32	110	20
Texas Gulf coast	3,308	3,030	3,054	3,580	85.3	1,621	241	1,380	33	267	605	200
La. Gulf Coast	2,529	2,289	2,324	2,908	79.9	1,068	176	892	28	283	482	122
N. La. and Ark.	168	150	155	252	61.5	56	4	52	3	1	43	8
New Mexico	87	73	74	76	97.4	49	14	35	8	1	17	—
Dist. 3 total	**6,586**	**5,996**	**6,065**	**7,380**	**82.2**	**3,112**	**512**	**2,600**	**94**	**584**	**1,257**	**350**
Dist. 4 total	**508**	**465**	**473**	**535**	**88.4**	**233**	**95**	**138**	**14**	**32**	**123**	**9**
Dist. 5 total	**2,833**	**2,707**	**2,755**	**3,231**	**85.3**	**1,208**	**274**	**934**	**40**	**351**	**450**	**369**
September 30, 1988	**14,519**	**13,362**	**13,522**	**15,917**	**85.0**	**6,834**	**1,184**	**5,650**	**185**	**1,213**	**2,846**	**934**
September 23, 1988†	**14,099**	**12,790**	**12,927**	**15,917**	**81.2**	**6,997**	**1,166**	**5,831**	**243**	**1,179**	**2,583**	**857**
October 2, 1987	**14,034**	**13,020**	**13,108**	**15,697**	**83.5**	**6,711**	**1,606**	**5,105**	**215**	**1,206**	**2,765**	**855**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—October 28, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,350	1,127	1,127	1,380	81.7	689	33	656	35	45	325	140
App. Dist. 1	112	107	110	107	102.8	44	8	36	—	—	35	3
Dist. 1 total	**1,462**	**1,234**	**1,237**	**1,487**	**83.2**	**733**	**41**	**692**	**35**	**45**	**360**	**143**
Ind., Ill., Ky.	2,009	1,901	1,911	2,254	84.8	1,127	106	1,021	9	101	439	61
Minn., Wis., Dak.	301	297	297	312	95.2	159	34	125	—	11	80	6
Okla., Kan., Mo.	742	660	665	718	92.6	417	93	324	7	42	181	9
Dist. 2 total	**3,052**	**2,858**	**2,873**	**3,284**	**87.5**	**1,703**	**233**	**1,470**	**16**	**154**	**700**	**76**
Inland Texas	594	515	523	569	91.9	304	73	231	25	25	134	16
Texas Gulf coast	3,478	3,040	3,052	3,580	85.3	1,619	156	1,463	32	279	628	168
La. Gulf Coast	2,446	2,218	2,248	2,908	77.3	1,060	186	874	38	286	467	87
N. La. and Ark.	128	103	106	252	42.1	48	18	30	7	—	27	7
New Mexico	89	71	71	76	93.4	51	17	34	5	1	17	—
Dist. 3 total	**6,735**	**5,947**	**6,000**	**7,385**	**81.2**	**3,082**	**450**	**2,632**	**107**	**591**	**1,273**	**278**
Dist. 4 total	**446**	**394**	**400**	**535**	**74.8**	**233**	**84**	**149**	**16**	**26**	**113**	**12**
Dist. 5 total	**2,522**	**2,458**	**2,519**	**3,231**	**78.0**	**1,163**	**273**	**890**	**51**	**307**	**344**	**368**
October 28, 1988	**14,217**	**12,891**	**13,029**	**15,922**	**81.8**	**6,914**	**1,081**	**5,833**	**225**	**1,123**	**2,790**	**877**
October 21, 1988†	**14,066**	**13,133**	**13,284**	**15,922**	**83.4**	**6,906**	**1,157**	**5,749**	**204**	**1,193**	**2,808**	**892**
October 30, 1987	**13,760**	**12,800**	**12,844**	**15,697**	**81.8**	**6,434**	**1,442**	**4,992**	**206**	**1,217**	**2,818**	**836**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API refinery report—November 25, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,307	1,125	1,139	1,380	82.5	630	61	569	31	72	265	92
App. Dist. 1	106	99	100	107	93.5	37	3	34	—	—	33	4
Dist. 1 total	**1,413**	**1,224**	**1,239**	**1,487**	**83.3**	**667**	**64**	**603**	**31**	**72**	**298**	**96**
Ind., Ill., Ky.	2,118	1,948	1,956	2,254	86.8	1,205	152	1,053	13	101	449	74
Minn., Wis., Dak.	313	307	307	312	98.4	169	43	126	—	10	78	7
Okla., Kan., Mo.	703	613	620	718	86.4	413	99	314	12	34	165	9
Dist. 2 total	**3,134**	**2,868**	**2,883**	**3,284**	**87.8**	**1,787**	**294**	**1,493**	**25**	**145**	**692**	**90**
Inland Texas	506	447	451	569	79.3	329	70	259	28	20	106	16
Texas Gulf coast	3,169	2,777	2,791	3,580	78.0	1,538	188	1,350	57	233	681	188
La. Gulf Coast	2,449	2,289	2,340	2,908	80.5	1,130	163	967	23	293	496	96
N. La. and Ark.	206	180	183	252	72.6	50	7	43	6	2	51	10
New Mexico	84	69	70	76	92.1	46	13	33	5	2	19	—
Dist. 3 total	**6,414**	**5,762**	**5,835**	**7,385**	**79.0**	**3,093**	**441**	**2,652**	**119**	**550**	**1,353**	**310**
Dist. 4 total	**454**	**426**	**426**	**535**	**79.6**	**228**	**83**	**145**	**13**	**26**	**122**	**11**
Dist. 5 total	**2,663**	**2,567**	**2,643**	**3,231**	**81.8**	**1,205**	**245**	**960**	**61**	**304**	**410**	**376**
November 25, 1988	**14,078**	**12,847**	**13,026**	**15,922**	**81.8**	**6,980**	**1,127**	**5,853**	**249**	**1,097**	**2,875**	**883**
November 18, 1988†	**14,306**	**13,055**	**13,242**	**15,922**	**83.2**	**6,949**	**1,226**	**5,723**	**234**	**1,103**	**2,913**	**881**
November 27, 1987	**14,364**	**13,108**	**13,194**	**15,697**	**84.1**	**6,889**	**1,564**	**5,325**	**196**	**1,210**	**2,990**	**903**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API refinery report—December 30, 1988

	Refinery operations (Thousands of barrels daily)					Refinery output (Thousands of barrels daily)						
						Motor gasoline			Jet fuel		Fuel oils	
District	**Total refinery input**	**Crude runs**	**Input to crude stills**	**Operable capacity**	**% operated**	**Total**	**Leaded***	**Unleaded***	**Naphtha**	**Kero**	**Distillate**	**Residual**
East coast	1,527	1,174	1,175	1,380	85.1	648	63	585	31	45	394	149
App. Dist. 1	111	104	107	107	100.0	38	4	34	—	—	34	5
Dist. 1 total	**1,638**	**1,278**	**1,282**	**1,487**	**86.2**	**686**	**67**	**619**	**31**	**45**	**428**	**154**
Ind., Ill., Ky.	2,218	1,957	1,992	2,254	88.4	1,241	117	1,124	9	117	503	77
Minn., Wis., Dak.	324	312	312	312	100.0	182	40	142	2	15	87	7
Okla., Kan., Mo.	765	690	699	718	97.4	402	114	288	12	52	175	12
Dist. 2 total	**3,307**	**2,959**	**3,003**	**3,284**	**91.4**	**1,825**	**271**	**1,554**	**23**	**184**	**765**	**96**
Inland Texas	496	459	461	569	81.0	345	71	274	25	32	139	17
Texas Gulf coast	3,161	2,859	2,859	3,580	79.9	1,523	142	1,381	25	332	616	243
La. Gulf Coast	2,607	2,385	2,392	2,908	82.3	1,307	163	1,144	15	327	525	180
N. La. and Ark.	179	164	164	252	65.1	58	12	46	5	—	58	9
New Mexico	82	70	71	76	93.4	40	15	25	8	2	16	—
Dist. 3 total	**6,525**	**5,937**	**5,947**	**7,385**	**80.5**	**3,273**	**403**	**2,870**	**78**	**693**	**1,354**	**449**
Dist. 4 total	**467**	**437**	**441**	**535**	**82.4**	**228**	**71**	**157**	**10**	**26**	**118**	**11**
Dist. 5 total	**2,802**	**2,682**	**2,724**	**3,231**	**84.3**	**1,254**	**236**	**1,018**	**63**	**383**	**444**	**355**
December 30, 1988	**14,739**	**13,293**	**13,397**	**15,922**	**84.1**	**7,266**	**1,048**	**6,218**	**205**	**1,333**	**3,109**	**1,065**
December 23, 1988†	**14,486**	**13,352**	**13,429**	**15,922**	**84.3**	**7,384**	**1,235**	**6,149**	**210**	**1,197**	**3,196**	**1,002**
January 1, 1988	**14,484**	**13,184**	**13,335**	**15,697**	**85.0**	**7,123**	**1,623**	**5,500**	**183**	**1,264**	**3,309**	**1,004**

*Included in total motor gasoline. †Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,072	64,962	13,757	45,943	5,262	1,239	8,861	46,882	20,014	12,516
PAD II	69,545	62,391	17,681	37,169	7,541	1,366	8,757	34,949	3,154	14,313
PAD III	160,701	69,184	14,014	39,282	15,868	2,746	14,571	30,415	12,522	42,970
PAD IV	12,803	7,477	2,309	3,086	2,082	406	896	3,183	343	2,345
PAD I-IV	**258,121**	**204,014**	**47,761**	**125,480**	**30,773**	**5,757**	**33,085**	**115,429**	**36,033**	**72,144**
PAD V	80,902*	31,539	7,782	15,907	7,850	1,813	6,350	10,175	9,030	23,637
January 29, 1988	**339,023***	**235,553**	**55,543**	**141,387**	**38,623**	**7,570**	**39,435**	**125,604**	**45,063**	**95,781**
January 22, 1988§	**341,238**	**234,887**	**55,386**	**139,405**	**40,096**	**7,861**	**38,186**	**129,069**	**44,978**	**94,163**
January 30, 1987	**328,872**	**251,358**	**70,453**	**140,540**	**40,365**	**7,403**	**41,835**	**142,036**	**42,081**	**94,611**

*Includes 23,539 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	14,274	67,261	12,505	49,118	5,638	1,489	8,320	43,287	19,149	12,156
PAD II	69,690	64,637	16,989	39,938	7,710	1,035	7,855	31,138	2,948	14,365
PAD III	159,461	67,538	12,561	39,506	15,471	2,355	13,959	22,922	14,058	45,128
PAD IV	13,004	7,932	2,385	3,149	2,398	399	955	3,178	306	2,337
PAD I-IV	**256,429**	**207,368**	**44,440**	**131,711**	**31,217**	**5,278**	**31,089**	**100,525**	**36,461**	**73,986**
PAD V	82,488*	31,508	7,322	15,570	8,616	1,429	6,636	9,702	9,185	22,750
February 26, 1988	**338,917***	**238,876**	**51,762**	**147,281**	**39,833**	**6,707**	**37,725**	**110,227**	**45,646**	**96,736**
February 19, 1988§	**333,384**	**240,303**	**52,510**	**147,675**	**40,118**	**7,073**	**36,377**	**112,636**	**46,487**	**95,359**
February 27, 1987	**329,383**	**252,918**	**70,399**	**139,789**	**42,730**	**6,854**	**41,310**	**127,101**	**38,036**	**100,875**

*Includes 27,854 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,337	65,883	11,853	48,863	5,167	1,201	9,453	34,377	16,797	12,093
PAD II	72,906	66,466	16,383	42,082	8,001	1,118	7,972	24,874	3,089	15,879
PAD III	160,594	60,403	10,767	36,046	13,590	2,724	14,509	22,622	12,204	48,753
PAD IV	13,537	7,915	2,518	3,129	2,268	346	859	2,801	339	1,897
PAD I-IV	**262,374**	**200,667**	**41,521**	**130,120**	**29,026**	**5,389**	**32,793**	**84,674**	**32,429**	**78,622**
PAD V	82,147*	29,352	6,860	14,433	8,059	1,278	5,916	9,058	8,854	23,177
March 25, 1988	**344,521***	**230,019**	**48,381**	**144,553**	**37,085**	**6,667**	**38,709**	**93,732**	**41,283**	**101,799**
March 18, 1988§	**344,065**	**234,241**	**48,867**	**146,711**	**38,663**	**6,508**	**38,762**	**98,257**	**42,563**	**98,951**
March 27, 1987	**329,208**	**245,617**	**65,918**	**136,776**	**42,923**	**6,919**	**41,903**	**106,330**	**37,976**	**104,619**

*Includes 25,489 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,963	64,485	11,383	48,804	4,298	1,144	9,088	31,442	15,922	10,834
PAD II	76,173	64,052	15,892	40,857	7,303	1,092	8,452	27,218	3,300	17,144
PAD III	171,463	63,675	10,736	38,042	14,897	2,680	13,291	23,892	13,212	48,481
PAD IV	13,953	7,028	1,933	3,022	2,073	404	883	2,239	334	2,155
PAD I-IV	**277,552**	**199,240**	**39,944**	**130,725**	**28,571**	**5,320**	**31,714**	**84,791**	**32,768**	**78,614**
PAD V	78,255*	30,752	7,262	15,508	7,982	1,376	6,057	9,825	8,148	24,497
April 29, 1988	**355,807***	**229,992**	**47,206**	**146,233**	**36,553**	**6,696**	**37,771**	**94,616**	**40,916**	**103,111**
April 22, 1988§	**356,498**	**225,913**	**46,669**	**141,817**	**37,427**	**6,774**	**38,424**	**93,337**	**41,107**	**103,992**
May 1, 1987	**327,425**	**243,479**	**59,922**	**142,008**	**41,549**	**6,521**	**40,894**	**100,151**	**38,034**	**105,717**

*Includes 27,497 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	16,598	62,731	10,306	48,423	4,002	1,306	10,027	32,257	18,281	12,284
PAD II	79,475	63,884	14,738	41,405	7,741	1,107	7,625	28,083	3,530	15,670
PAD III	170,940	61,341	10,935	36,497	13,909	2,020	13,562	25,366	12,548	50,967
PAD IV	13,395	6,938	1,943	2,715	2,280	361	754	2,650	452	2,395
PAD I-IV	**280,408**	**194,894**	**37,922**	**129,040**	**27,932**	**4,794**	**31,968**	**88,356**	**34,811**	**81,316**
PAD V	77,978*	30,687	7,626	14,958	8,103	1,544	6,358	10,957	8,117	26,680
May 27, 1988	**358,386***	**225,581**	**45,548**	**143,998**	**36,035**	**6,338**	**38,326**	**99,313**	**42,928**	**107,996**
May 20, 1988§	**363,509**	**227,428**	**46,590**	**144,332**	**36,506**	**6,875**	**37,820**	**96,781**	**43,803**	**107,343**
May 29, 1987	**323,625**	**231,427**	**57,804**	**134,777**	**38,846**	**7,058**	**39,391**	**99,111**	**40,724**	**104,339**

*Includes 25,903 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	16,225	60,813	10,290	46,099	4,424	1,246	10,151	38,398	16,893	12,456
PAD II	82,337	58,085	14,364	36,813	6,908	1,434	7,490	27,946	3,712	15,987
PAD III	168,632	61,388	10,969	36,313	14,106	2,042	13,704	27,554	13,089	53,438
PAD IV	13,279	6,441	2,038	2,619	1,784	366	816	3,196	503	2,208
PAD I-IV	**280,473**	**186,727**	**37,661**	**121,844**	**27,222**	**5,088**	**32,161**	**97,094**	**34,197**	**84,089**
PAD V	78,326*	27,665	6,358	13,032	8,275	1,485	6,949	12,307	6,887	28,268
June 24, 1988	**358,799***	**214,392**	**44,019**	**134,876**	**35,497**	**6,573**	**39,110**	**109,401**	**41,084**	**112,357**
June 17, 1988§	**364,816**	**221,659**	**44,303**	**141,208**	**36,148**	**6,848**	**37,847**	**108,823**	**41,498**	**112,641**
June 26, 1987	**325,577**	**230,930**	**56,677**	**135,638**	**38,615**	**7,171**	**38,050**	**102,507**	**37,901**	**102,768**

*Includes 23,239 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,488	58,594	10,828	42,589	5,177	1,342	10,864	41,674	15,784	13,680
PAD II	79,821	55,354	14,111	34,581	6,662	1,314	7,735	30,563	3,978	16,846
PAD III	168,486	62,458	10,472	37,259	14,727	2,759	13,325	29,383	12,605	52,132
PAD IV	13,016	5,379	1,573	2,259	1,547	369	794	3,488	493	2,170
PAD I-IV	**276,811**	**181,785**	**36,984**	**116,688**	**28,113**	**5,784**	**32,718**	**105,108**	**32,860**	**84,828**
PAD V	70,871*	28,010	5,560	14,157	8,293	1,558	6,983	12,859	7,799	29,023
July 29, 1988	**347,682***	**209,795**	**42,544**	**130,845**	**36,406**	**7,342**	**39,701**	**117,967**	**40,659**	**113,851**
July 22, 1988§	**349,713**	**207,910**	**42,077**	**130,173**	**35,660**	**7,343**	**40,129**	**117,329**	**40,992**	**113,021**
July 31, 1987	**328,557**	**229,628**	**54,624**	**135,655**	**39,349**	**7,576**	**40,167**	**114,364**	**41,863**	**100,406**

*Includes 18,759 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	16,167	59,707	10,220	44,777	4,710	1,312	10,247	47,207	15,128	14,012
PAD II	73,498	60,950	14,720	38,007	8,223	1,088	7,499	29,836	3,998	15,948
PAD III	161,577	61,695	9,986	36,478	15,231	2,671	14,467	29,290	11,788	50,110
PAD IV	11,718	5,745	1,981	2,260	1,504	352	841	3,071	533	1,911
PAD I-IV	**262,960**	**188,097**	**36,907**	**121,522**	**29,668**	**5,423**	**33,054**	**109,404**	**31,447**	**81,981**
PAD V	73,033*	27,354	6,025	13,466	7,863	1,467	6,840	10,643	7,083	28,431
August 26, 1988	**335,993***	**215,451**	**42,932**	**134,988**	**37,531**	**6,890**	**39,894**	**120,047**	**38,530**	**110,412**
August 19, 1988§	**340,227**	**214,752**	**43,381**	**134,460**	**36,911**	**6,910**	**39,246**	**123,003**	**38,989**	**111,951**
August 28, 1987	**331,264**	**225,684**	**53,369**	**134,375**	**37,940**	**6,797**	**41,329**	**123,004**	**42,961**	**104,148**

*Includes 19,260 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,501	60,652	9,287	46,579	4,786	1,101	10,019	54,165	18,911	12,013
PAD II	62,927	62,290	13,223	40,505	8,562	945	8,426	30,584	3,204	15,173
PAD III	154,700	61,990	10,350	36,042	15,598	2,416	14,783	29,317	12,933	50,112
PAD IV	11,587	6,224	2,003	2,535	1,686	331	780	2,926	555	1,960
PAD I-IV	**244,715**	**191,156**	**34,863**	**125,661**	**30,632**	**4,793**	**34,008**	**116,992**	**35,603**	**79,258**
PAD V	79,423*	30,563	6,772	15,955	7,836	1,844	7,329	12,841	8,761	28,919
September 30, 1988	**324,138***	**221,719**	**41,635**	**141,616**	**38,468**	**6,637**	**41,337**	**129,833**	**44,364**	**108,177**
September 23, 1988§	**318,827**	**218,545**	**41,537**	**139,220**	**37,788**	**6,729**	**40,860**	**132,189**	**43,568**	**107,382**
October 2, 1987	**334,365**	**229,469**	**54,589**	**135,431**	**39,449**	**6,458**	**43,690**	**128,865**	**45,174**	**103,308**

*Includes 21,630 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,230	59,171	8,894	45,390	4,887	1,088	9,910	57,497	17,288	11,013
PAD II	67,460	58,231	11,870	38,669	7,692	816	7,491	28,694	3,006	15,977
PAD III	156,579	61,790	9,081	37,457	15,252	2,455	16,229	28,650	11,009	51,333
PAD IV	11,816	6,063	1,803	2,721	1,539	388	812	2,461	608	1,912
PAD I-IV	**251,085**	**185,255**	**31,648**	**124,237**	**29,370**	**4,747**	**34,442**	**117,302**	**31,911**	**80,235**
PAD V	81,513*	29,751	6,427	15,307	8,017	1,662	7,027	11,484	8,194	29,048
October 28, 1988	**332,598***	**215,006**	**38,075**	**139,544**	**37,387**	**6,409**	**41,469**	**128,786**	**40,105**	**109,283**
October 21, 1988§	**333,640**	**216,003**	**39,207**	**138,687**	**38,109**	**6,362**	**42,272**	**127,175**	**42,270**	**109,763**
October 30, 1987	**349,925**	**219,751**	**51,658**	**130,630**	**37,463**	**6,485**	**42,512**	**124,921**	**46,923**	**102,918**

*Includes 24,992 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,002	58,488	8,131	45,647	4,710	1,214	10,739	56,247	17,138	12,256
PAD II	71,052	59,293	12,650	39,084	7,559	622	7,078	28,579	2,770	17,316
PAD III	161,839	61,841	9,499	37,062	15,280	2,408	13,816	28,744	11,653	52,375
PAD IV	11,762	6,629	2,134	2,774	1,721	372	816	2,516	618	1,827
PAD I-IV	**259,655**	**186,251**	**32,414**	**124,567**	**29,270**	**4,616**	**32,449**	**116,086**	**32,179**	**83,774**
PAD V	81,193*	29,237	6,193	15,390	7,654	2,005	6,851	11,552	8,512	27,360
November 25, 1988	**340,848***	**215,488**	**38,607**	**139,957**	**36,924**	**6,621**	**39,300**	**127,638**	**40,691**	**111,134**
November 18, 1988§	**343,507**	**217,981**	**38,630**	**142,623**	**36,728**	**6,368**	**39,649**	**125,882**	**40,492**	**110,955**
November 27, 1987	**355,101**	**223,963**	**53,347**	**133,816**	**36,800**	**6,590**	**43,127**	**124,685**	**47,669**	**102,444**

*Includes 22,834 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API crude and product stocks

(Thousands of barrels)

		Motor gasoline				Jet fuels		Fuel oils		
	Crude oil	Total	Leaded†	Unleaded†	Blending Comp.†	Naphtha	Kerosine	Distillate	Residual	Unfinished oils
PAD I	15,899	60,654	8,713	47,453	4,488	1,111	9,444	52,478	19,752	12,076
PAD II	70,520	61,221	13,501	39,928	7,792	769	7,694	30,784	3,191	14,930
PAD III	157,005	67,611	10,197	41,662	15,752	1,829	13,202	27,461	12,863	47,536
PAD IV	11,803	7,327	1,965	3,169	2,193	357	761	2,751	672	1,905
PAD I-IV	**255,227**	**196,813**	**34,376**	**132,212**	**30,225**	**4,066**	**31,101**	**113,474**	**36,478**	**76,447**
PAD V	79,189*	32,755	6,615	17,357	8,783	2,247	6,846	12,958	8,696	23,498
December 30, 1988	**334,416***	**229,568**	**40,991**	**149,569**	**39,008**	**6,313**	**37,947**	**126,432**	**45,174**	**99,945**
December 23, 1988§	**338,292**	**221,640**	**39,407**	**143,501**	**38,732**	**6,319**	**36,917**	**125,243**	**44,407**	**103,926**
January 1, 1988	**350,510**	**227,375**	**54,356**	**135,136**	**37,883**	**7,217**	**43,666**	**136,547**	**46,289**	**92,013**

*Includes 21,049 bbl. of Alaskan crude in transit by water. †Included in total motor gasoline. §Revised.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	1–29 1988	1–22* 1988	1–29 1988	1–22* 1988	1–29 1988	1–22* 1988	1–30 1987
Total motor gasoline	245	378	16	23	261	401	296
Leaded gasoline†	5	28	—	7	5	35	37
Unleaded gasoline†	240	350	16	16	256	366	259
Mo. gas. blending comp.	14	7	—	—	14	7	42
Distillate§	322	338	5	5	327	343	335
Residual	550	689	12	16	562	705	706
Jet fuel-naphtha	4	4	—	—	4	4	6
Jet fuel-kerosine	3	22	—	2	3	24	4
LPG	342	263	9	8	351	271	232
Unfinished oils	261	247	4	2	265	249	186
Other	602	285	—	36	602	321	172
Total products	**2,343**	**2,233**	**46**	**92**	**2,389**	**2,325**	**1,979**
Canadian crude	474	723	14	9	488	732	583
Other foreign	4,003	3,411	96	92	4,099	3,503	3,126
Total crude	**4,477**	**4,134**	**110**	**101**	**4,587**	**4,235**	**3,709**
Total imports	**6,820**	**6,367**	**156**	**193**	**6,976**	**6,560**	**5,688**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	2–26 1988	2–19* 1988	2–26 1988	2–19* 1988	2–26 1988	2–19* 1988	2–27 1987
Total motor gasoline	298	476	17	21	315	497	279
Leaded gasoline†	10	14	—	—	10	14	41
Unleaded gasoline†	288	462	17	21	305	483	238
Mo. gas. blending comp.	60	14	11	3	71	17	17
Distillate§	118	314	2	2	120	316	227
Residual	622	706	3	2	625	708	725
Jet fuel-naphtha	2	—	—	—	2	—	26
Jet fuel-kerosine	22	—	—	—	22	—	57
LPG	234	137	16	44	250	181	244
Unfinished oils	162	200	—	—	162	200	218
Other	248	346	—	—	248	346	574
Total products	**1,766**	**2,193**	**49**	**72**	**1,815**	**2,265**	**2,367**
Canadian crude	693	670	18	29	711	699	534
Other foreign	3,930	3,328	56	143	3,986	3,471	3,441
Total crude	**4,623**	**3,998**	**74**	**172**	**4,697**	**4,170**	**3,975**
Total imports	**6,389**	**6,191**	**123**	**244**	**6,512**	**6,435**	**6,342**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	3–25 1988	3–18* 1988	3–25 1988	3–18* 1988	3–25 1988	3–18* 1988	3–27 1987
Total motor gasoline	258	728	10	2	268	730	248
Leaded gasoline†	41	39	—	—	41	39	12
Unleaded gasoline†	217	689	10	2	227	691	236
Mo. gas. blending comp.	40	—	7	—	47	—	73
Distillate§	210	139	2	1	212	140	244
Residual	415	413	7	5	422	418	391
Jet fuel-naphtha	3	2	—	—	3	2	13
Jet fuel-kerosine	85	4	4	—	89	4	35
LPG	186	272	14	9	200	281	177
Unfinished oils	93	275	2	—	95	275	160
Other	347	157	—	—	347	157	346
Total products	**1,637**	**1,990**	**46**	**17**	**1,683**	**2,007**	**1,687**
Canadian crude	742	745	—	8	742	753	576
Other foreign	3,360	3,924	35	225	3,395	4,149	3,022
Total crude	**4,102**	**4,669**	**35**	**233**	**4,137**	**4,902**	**3,598**
Total imports	**5,739**	**6,659**	**81**	**250**	**5,820**	**6,909**	**5,285**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	4–29 1988	4–22* 1988	4–29 1988	4–22* 1988	4–29 1988	4–22* 1988	5–1 1987
Total motor gasoline	442	300	17	18	459	318	516
Leaded gasoline†	21	15	1	1	22	16	1
Unleaded gasoline†	421	285	16	17	437	302	515
Mo. gas. blending comp.	66	40	5	11	71	51	42
Distillate§	344	161	1	1	345	162	84
Residual	366	566	51	12	417	578	608
Jet fuel-naphtha	3	3	—	—	3	3	11
Jet fuel-kerosine	24	54	—	9	24	63	61
LPG	274	279	7	9	281	288	125
Unfinished oils	264	348	—	—	264	348	209
Other	214	152	—	—	214	152	127
Total products	**1,997**	**1,903**	**81**	**60**	**2,078**	**1,963**	**1,783**
Canadian crude	637	582	34	—	671	582	634
Other foreign	3,477	4,860	—	335	3,477	5,195	3,738
Total crude	**4,114**	**5,442**	**34**	**335**	**4,148**	**5,777**	**4,372**
Total imports	**6,111**	**7,345**	**115**	**395**	**6,226**	**7,740**	**6,155**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	5–27 1988	5–20* 1988	5–27 1988	5–20* 1988	5–27 1988	5–20* 1988	5–29 1987
Total motor gasoline	350	428	11	19	361	447	229
Leaded gasoline†	6	3	—	—	6	3	25
Unleaded gasoline†	344	425	11	19	355	444	204
Mo. gas. blending comp.	43	74	4	21	47	95	47
Distillate§	168	189	15	3	183	192	227
Residual	301	424	5	20	306	444	1,118
Jet fuel-naphtha	2	3	—	—	2	3	14
Jet fuel-kerosine	66	25	9	—	75	25	48
LPG	111	114	6	6	117	120	108
Unfinished oils	324	196	1	—	325	196	370
Other	152	532	—	47	152	579	251
Total products	**1,517**	**1,985**	**51**	**116**	**1,568**	**2,101**	**2,412**
Canadian crude	587	660	15	26	602	686	656
Other foreign	4,120	5,195	157	428	4,277	5,623	4,525
Total crude	**4,707**	**5,855**	**172**	**454**	**4,879**	**6,309**	**5,181**
Total imports	**6,224**	**7,840**	**223**	**570**	**6,447**	**8,410**	**7,593**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	6–24 1988	6–17* 1988	6–24 1988	6–17* 1988	6–24 1988	6–17* 1988	6–26 1987
Total motor gasoline	432	212	24	4	456	216	428
Leaded gasoline†	16	28	—	—	16	28	73
Unleaded gasoline†	416	184	24	4	440	188	355
Mo. gas. blending comp.	80	96	2	—	82	96	42
Distillate§	353	260	4	2	357	262	451
Residual	352	400	4	28	356	428	463
Jet fuel-naphtha	3	2	—	—	3	2	16
Jet fuel-kerosine	111	81	12	7	123	88	9
LPG	83	95	2	5	85	100	181
Unfinished oils	376	338	—	—	376	338	229
Other	297	46	—	—	297	46	406
Total products	**2,087**	**1,530**	**48**	**46**	**2,135**	**1,576**	**2,225**
Canadian crude	693	686	15	15	708	701	439
Other foreign	3,398	4,286	78	403	3,476	4,689	4,839
Total crude	**4,091**	**4,972**	**93**	**418**	**4,184**	**5,390**	**5,278**
Total imports	**6,178**	**6,502**	**141**	**464**	**6,319**	**6,966**	**7,503**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	7–29 1988	7–22* 1988	7–29 1988	7–22* 1988	7–29 1988	7–22* 1988	7–31 1987
Total motor gasoline	723	458	28	28	751	486	674
Leaded gasoline†	121	62	—	3	121	65	18
Unleaded gasoline†	602	396	28	25	630	421	656
Mo. gas. blending comp.	64	178	1	2	65	180	21
Distillate§	352	146	3	2	355	148	635
Residual	443	319	44	6	487	325	786
Jet fuel-naphtha	3	55	—	—	3	55	4
Jet fuel-kerosine	65	117	8	8	73	125	18
LPG	206	204	9	15	215	219	63
Unfinished oils	465	426	4	9	469	435	100
Other	333	127	—	—	333	127	272
Total products	**2,654**	**2,030**	**97**	**70**	**2,751**	**2,100**	**2,573**
Canadian crude	596	758	9	29	605	787	601
Other foreign	4,333	4,434	67	61	4,400	4,495	5,452
Total crude	**4,929**	**5,192**	**76**	**90**	**5,005**	**5,282**	**6,053**
Total imports	**7,583**	**7,222**	**173**	**160**	**7,756**	**7,382**	**8,626**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	8–26 1988	8–19* 1988	8–26 1988	8–19* 1988	8–26 1988	8–19* 1988	8–28 1987
Total motor gasoline	535	507	27	28	562	535	582
Leaded gasoline†	25	34	—	1	25	35	44
Unleaded gasoline†	510	473	27	27	537	500	538
Mo. gas. blending comp.	48	73	—	—	48	73	129
Distillate§	153	237	3	5	156	242	172
Residual	382	479	5	8	387	487	512
Jet fuel-naphtha	4	3	—	—	4	3	—
Jet fuel-kerosine	75	158	3	9	78	167	16
LPG	90	103	7	7	97	110	165
Unfinished oils	246	152	—	1	246	153	320
Other	168	123	—	—	168	123	224
Total products	**1,701**	**1,835**	**45**	**58**	**1,746**	**1,893**	**2,120**
Canadian crude	606	741	16	7	622	748	707
Other foreign	4,545	3,411	169	157	4,714	3,568	4,599
Total crude	**5,151**	**4,152**	**185**	**164**	**5,336**	**4,316**	**5,306**
Total imports	**6,852**	**5,987**	**230**	**222**	**7,082**	**6,209**	**7,426**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	9–30 1988	9–23* 1988	9–30 1988	9–23* 1988	9–30 1988	9–23* 1988	10–2 1987
Total motor gasoline	314	309	29	26	343	335	575
Leaded gasoline†	17	—	—	—	17	—	43
Unleaded gasoline†	297	309	29	26	326	335	532
Mo. gas. blending comp.	51	133	—	—	51	133	44
Distillate§	240	257	4	3	244	260	344
Residual	446	685	5	6	451	691	171
Jet fuel-naphtha	3	4	—	—	3	4	2
Jet fuel-kerosine	53	50	3	2	56	52	62
LPG	198	191	11	11	209	202	234
Unfinished oils	332	317	3	3	335	320	241
Other	269	111	—	—	269	111	300
Total products	**1,906**	**2,057**	**55**	**51**	**1,961**	**2,108**	**1,973**
Canadian crude	614	623	3	7	617	630	609
Other foreign	4,905	3,717	141	317	5,046	4,034	4,483
Total crude	**5,519**	**4,340**	**144**	**324**	**5,663**	**4,664**	**5,092**
Total imports	**7,425**	**6,397**	**199**	**375**	**7,624**	**6,772**	**7,065**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	10–28 1988	10–21* 1988	10–28 1988	10–21* 1988	10–28 1988	10–21* 1988	10–30 1987
Total motor gasoline	416	500	25	28	441	528	280
Leaded gasoline†	—	3	—	—	—	3	20
Unleaded gasoline†	416	497	25	28	441	525	260
Mo. gas. blending comp.	121	45	—	—	121	45	88
Distillate§	363	317	2	4	365	321	191
Residual	593	526	7	33	600	559	524
Jet fuel-naphtha	3	4	—	—	3	4	3
Jet fuel-kerosine	74	59	24	22	98	81	17
LPG	264	161	25	12	289	173	257
Unfinished oils	238	379	—	—	238	379	187
Other	336	51	—	—	336	51	563
Total products	**2,408**	**2,042**	**83**	**99**	**2,491**	**2,141**	**2,110**
Canadian crude	698	738	—	6	698	744	714
Other foreign	4,030	4,223	163	318	4,193	4,541	4,768
Total crude	**4,728**	**4,961**	**163**	**324**	**4,891**	**5,285**	**5,482**
Total imports	**7,136**	**7,003**	**246**	**423**	**7,382**	**7,426**	**7,592**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	11–25 1988	11–18* 1988	11–25 1988	11–18* 1988	11–25 1988	11–18* 1988	11–27 1987
Total motor gasoline	531	713	35	40	566	753	642
Leaded gasoline†	—	13	—	—	—	13	98
Unleaded gasoline†	531	700	35	40	566	740	544
Mo. gas. blending comp.	58	96	—	—	58	96	81
Distillate§	275	408	7	3	282	411	133
Residual	616	850	9	8	625	858	733
Jet fuel-naphtha	3	3	—	—	3	3	30
Jet fuel-kerosine	55	76	14	25	69	101	50
LPG	256	349	13	12	269	361	289
Unfinished oils	321	532	1	1	322	533	161
Other	57	233	—	—	57	233	321
Total products	**2,172**	**3,260**	**79**	**89**	**2,251**	**3,349**	**2,440**
Canadian crude	629	654	15	26	644	680	631
Other foreign	4,066	4,022	43	269	4,109	4,291	3,928
Total crude	**4,695**	**4,676**	**58**	**295**	**4,753**	**4,971**	**4,559**
Total imports	**6,867**	**7,936**	**137**	**384**	**7,004**	**8,320**	**6,999**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

API imports of crude and products

(Thousands of barrels daily)

	Districts 1-4		District 5		Total U.S.		
	12–30 1988	12–23* 1988	12–30 1988	12–23* 1988	12–30 1988	12–23* 1988	1–1 1988
Total motor gasoline	182	360	17	29	199	389	227
Leaded gasoline†	—	—	—	—	—	—	9
Unleaded gasoline†	182	360	17	29	199	389	218
Mo. gas. blending comp.	176	37	—	—	176	37	54
Distillate§	290	322	2	4	292	326	215
Residual	861	1,284	25	17	886	1,301	507
Jet fuel-naphtha	3	3	—	—	3	3	32
Jet fuel-kerosine	109	81	13	20	122	101	79
LPG	251	141	7	6	258	147	370
Unfinished oils	216	195	—	—	216	195	428
Other	485	323	—	5	485	328	305
Total products	**2,573**	**2,746**	**64**	**81**	**2,637**	**2,827**	**2,217**
Canadian crude	667	620	—	24	667	644	527
Other foreign	4,871	3,929	136	148	5,007	4,077	4,011
Total crude	**5,538**	**4,549**	**136**	**172**	**5,674**	**4,721**	**4,538**
Total imports	**8,111**	**7,295**	**200**	**253**	**8,311**	**7,548**	**6,755**

*Revised. †Included in total motor gasoline. §Includes No. 4 fuel oil.
Source: American Petroleum Institute
Data available in Oil & Gas Journal Energy Database.

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